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[OFFICIAL NOTICE.]

## The Fourteenth Annual Meeting of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
September 27, 1886.

*To the Members of the Association:*—As already announced, the Fourteenth Annual Meeting of our Association will be held in the city of Philadelphia, Pa., on Wednesday, Thursday, and Friday, October 20th, 21st, and 22d. The meetings will be held at the *foyer* of the Academy of Music. The Convention will be called to order by the President, A. C. Wood, Esq., of Syracuse, N. Y., on Wednesday morning, the 20th proximo, at 10 o'clock. The headquarters of the Association will be at Hotel Lafayette, corner Broad and Chestnut streets, while the banquet will take place at the dining hall of the Union League Club. These selections are most happy ones, and assure us most congenial surroundings during our stay in Philadelphia. The hotel is about three minutes' walk from the depot of the Pennsylvania Railroad, and the Academy of Music is adjacent to the hotel. The hotel is run on both the American and European plans.

In order that the Committee may be enabled to properly take care of the members when they arrive in Philadelphia it is absolutely necessary that we should know at the earliest moment just how many members will be in attendance. I beg, therefore, that each member will inform me as promptly as possible whether he expects to be at the meeting, whether he wishes the Committee to secure rooms for him, and whether he will bring with him any members of his family. Also state when he expects to arrive in Philadelphia.

It is to be regretted that the members who have promised to provide papers for the meeting have been so backward in sending in the titles of their essays; however, I am able to announce the following papers now, and hope to add to the list shortly:

"Gas Commissions," by Geo. G. Ramsdell, of Vincennes, Ind. "A New Departure in Gas Holder Houses," by Captain Wm. Henry White, of New York. "Three-Hour Charges," by A. B. Slater, of Providence, R. I. "Condensation," by Robt. B. Taber, of New Bedford, Mass. "Statistics Regarding the Gas Companies of America," by Wm. W. Goodwin, of Philadelphia. "Suggestions upon Candle Power and Illumination," by A. E. Boardman, of Macon, Georgia.

This list, to say the least, is promising, for though short it includes many interesting themes. There has long been a feeling abroad that the National Association should speak, and in no uncertain voice, on the important question of the day—the establishment of Gas Commissions; it is well, therefore, that the question should be brought up at this time, so that it may be clear to all just where the Association stands in this matter.

In these days of sharp competition it is very necessary that the erection of new gas works, and the extension of old ones, should be carried out in conformity with the most modern thoughts in gas engineering, and it is equally imperative that the work should be done at the minimum cost consistent with substantial work, so that the charge for dividend may be kept down to the lowest point; if, therefore, our friend Capt. White can show us how to save money in the construction of a holder-house, the information will be most welcome, at least to those members of the fraternity who believe in the wisdom of protecting gas holders from the snow and gales of winter.

There was a time when it was thought necessary to consume six hours in burning off a charge of coal, but more recently it has been thought that four

hours are all sufficient for this purpose; and so, in this country at least, four-hour charges have become the rule. There are, however, exceptions to all rules; and, therefore, we are not surprised at finding this rule disregarded in at least one instance. It is now well known that at Providence, R. I., the coal is baked off in three hours; and the Association will doubtless be very glad to know the ins and outs of this innovation.

If there is any one branch of the gas business upon which we need additional light more than another it is the condensation of gas. The paper promised by Mr. Taber will, therefore, be looked forward to with more than ordinary interest.

The statistics in our possession regarding the gas business, or the gas companies of this country, are so meagre that we must gladly welcome any additions to our scanty store. The facts promised by Mr. Goodwin will doubtless form a valuable addition to the literary part of the programme of the forthcoming meeting.

That the lighting effect of substances is not always in proportion to the candle power is a contention that may well be advanced, with some show of reason; however, we would not run the risk of forestalling what Mr. Boardman has to say on this theme, but will await with pleasure the reading of the author's views.

The value of the Fourteenth Annual Meeting of our Association will be greatly enhanced if the members will think over the various subjects suggested by this list of papers between the present time and our convening at Philadelphia, and come prepared to take active parts in the discussion of these various topics.

As previously announced, if members have any special subjects which they desire to have discussed at the coming meeting, or have any questions in mind upon which they desire light, if they will send notice of the same to the Secretary an effort will be made to have the subjects considered.

Respectfully, C. J. R. Humphreys, Sec.

## THE GUILD OF GAS MANAGERS VISITS NORTH ATTLEBORO', MASS.

The Members of the Guild of Gas Managers, on the occasion of its September meeting, determined to take Secretary Pratt at his word; and as a consequence the Mason Building headquarters—or permanent Boston home of the Guild—did not present the usual animated appearance when the day and hour of the regular monthly gathering for September were reached. But if the Mason Building was for the nonce shrouded in gloom, because of the absence of those who there are wont to congregate, on business and pleasure bent, it may not be said that like gloomy conditions prevailed at jewelry town—N. Attleboro's "other" name—on Saturday, September 11th. In accordance with Secretary Pratt's invitation—the Secretary is also Superintendent of the North Attleboro' Gas Light Company—who was authorized to extend that invitation in the name of the directors of the gas company, the Guild men assembled in force on the date set apart, and on their arrival were at once escorted, by Secretary Pratt, to the Wamsutta House, where luncheon awaited them. This pleasant task performed to the satisfaction of all concerned, the hotel parlor was invaded, and the regular business of the monthly session was transacted. Mr. C. F. Spaulding, of Brookline, Mass., read a paper on the subject of "Electric Lighting," but the author did not deal with the topic in the way in which it was hoped he would. Mr. Spaulding, from his connection (being interested in the matter of the practical supply of electricity in a commercial way) with this matter, was eminently fitted to furnish the Guild with a most valuable contribution to the literature of the topic did he but choose to disclose the figures of cost, etc., about which he must be thoroughly conversant. There can be no doubt, however, that Mr. Spaulding is decidedly in favor of the operation, by gas companies, of combined gas and electric plants, and his advocacy of the system, while not backed up by chapter and verse argument, must of necessity cause gas managers, who have hitherto been adverse to the joint proposition, to put on their thinking caps. Speaking for ourselves, however, we are not yet disposed to assent to Mr. Spaulding's views, and simply because the practical working data of such schemes are missing from the records; or, rather, these have never appeared upon the records. Mr. Spaulding's paper, by courtesy of the Guild, will be published in our next issue. Perhaps the discussion that followed its reading may have developed that which Mr. Spaulding's paper does not reveal; if so, of course, those in attendance at the discussion have received important hints which, for the present at any rate, must remain concealed from the fraternity at large.

With the conclusion of the business proceedings carriages were taken and the members were carried out to the gas works, which was subjected to a thorough and critical examination. Much surprise was manifested over the completeness and magnitude of jewelry town's gas plant, and Supt. Pratt was obliged to confess he thought the "establishment was a pretty good one—for a country town." Pratt, you know, is modest and retiring—except! From the gas works the party proceeded to Robinson's extensive button factory, and from thence to the immense jewelry shops and factory of Mr. B. S. Freeman. The water works and pumping station were next visited, Supt. Whittemore doing the honors with his accustomed thoroughness. From the last place mentioned the route wound its way among the many points of interest in the vicinity of the city and suburbs, among the features being included charming views of both North Attleboro' and Attleboro' Falls. The tourists returned to the Wamsutta House at an early hour, and in fine condition for an attack upon an elaborate dinner, the vote of the participants being unanimously recorded, in the affirmative, that it was "a good thing to be there." Supt. Pratt welcomed the guests, and Mr. C. H. Randall, Treasurer of the gas company, ably assisted. President Slater, of the Guild, voiced the pleasure felt by himself and associates in regard to the Attleboro' visit, and Brother Stiness, of Pawtucket, closed his statement of how he viewed the case by proposing the sentiment, "The North Attleboro' Gas Light Company—may its prosperity be like its hospitality, unbounded!" It is reported that the representative of the Attleboro' *Chronicle*, who faithfully recorded the doings in acceptable journalistic manner, added a few chestnuts to the already profuse bill of fare—but was magnanimously forgiven for his temerity. The banquet was concluded—*i. e.*, after the "festive board" had been made to resemble a wreck—by the passing of a formal resolution of thanks, offered by Mr. Geo. B. Neal, to Sec'y Pratt and the Attleboro' Gas Light Company.

## HOW THE HARTLEY FUND WAS EXPENDED.

Mr. W. H. Bennett, in accordance with his duties as Secretary and temporary custodian of the fund collected for the benefit of the family of the late Mr. Hartley, has favored us with a circular containing some interesting information. From the figures published it is revealed that the entire amount subscribed amounted to £1045 8s. 3d. Of that sum £775 19s. 6d. were handed in by the gas interests of England; £197 were received from sources credited in the circular to "sundry benevolent institutions;" the remaining £61 11s. 3d. represent the moneys subscribed by gas men on this side of the Atlantic through the Journal. As to the disposition of the moneys we quote the language of the circular: "Of this total £753 15s. have been invested in consols, in the names of Messrs. Harris, Morton and Sugg as Trustees; £93 9s. 6d. have been expended in providing a suitable house, with business furniture and stock-in-trade, whereby the three eldest daughters have been established in business which bids fair to be successful; printing, postages, and incidental expenses have amounted to £11 8s. 6d.; and there is now a balance of £186 15s. 3d. at the London and County Bank. This, with the dividends arising from the investment, will be devoted to the education and maintenance of the younger members of the family, and to assist the elder ones until the proceeds of the business shall be sufficient to render further help unnecessary." In conclusion we cannot forbear from expressing admiration at the tact and zeal which kept the sum disbursed for expenses at such a remarkably low figure.

## BOOKS RECEIVED.

To the courtesy of the Scientific Publishing Company, London, England, we are indebted for a copy of "The Gas Engineer's Chemical Manual," by Prof. J. Alfred Wanklyn. The volume is divided into seven chapters, each of which treats, with clearness and conciseness, of a distinct branch of the chemistry of gas making. In his prefatory remarks Prof. Wanklyn says; "This book is designed to widen the chemical aspects of the gas industry to those who are actively engaged in the manufacture of gas." And it is only justice to the author to say that he has succeeded admirably in achieving the object sought to be attained.

Another volume, from the press of Mr. Walter King, London, England, is the production of that clever writer and compiler, Mr. Thos. Newbigging. It bears the title of "Devices for Gas Illuminations," and its appearance is most timely, for our English brethren are about to have their hands pretty well filled in attending to the matter of rejoicings over the jubilee of the reigning Queen, in which rejoicings "decorative illumination" by gas is sure to play a prominent part. The brochure contains 41 plates of designs, instructions in regard to the pipes, etc., necessary to ensure proper lighting effect; and also describes the materials and quantities necessary for the preparation of eight distinct sorts of colored fires. The typography and binding of the volume are marvels of the printer's art. We have also received a copy of the "Transactions of the Gas Institute for 1886," for which we have to thank the Institute's Secretary, Mr. W. H. Bennett. Should any of our readers desire to procure copies of the above mentioned volumes, they may secure them by sending their orders to this office.

The pipe line receipts of crude oil during the month of August are reported at a total of 2,440,787.82 barrels, or 78,735 barrels per day. The total increase in stock on hand in August is shown to have been 371,907 barrels, or at the rate of 11,997 barrels per day.

[A Paper read before the Society of Gas Lighting.]

## The Proper Position for the Gas Exhauster.

By C. J. R. Humphreys.

The old motto, which joins to the plain statement of the fact that there is a place for everything, the mandate that everything should be in its place, was coined, doubtless, to apply to the portable machines and tools of a shop or factory; but it can scarcely be disputed that this truism ought to apply equally well to the permanent machines and apparatuses of a manufactory. If so, then in the layout of a gas works there is, without doubt, a certain place for the gas exhauster, and there it should be found.

I always supposed that the proper location for this machine was before the condensers; but I find this arrangement is contrary to the practice at many large gas works in the country. In fact there seems to be a great diversity of opinion on this score, some engineers holding that the exhauster should be close to the hydraulic, while others claim that it should be as far from the hydraulic as possible.

There are, then, three positions for the exhauster, each of which has its advocates among the fraternity. First, before the condensers; second, between the condenser and washer; third, after the washer. The objection raised against the first layout is that when the machine is placed here, before the condensers, it has to pump considerable amounts of tar and aqueous vapor which are c rried along with the gas; whereas, if placed after the condensers, this extra duty will not be required of the exhauster, as the tar and aqueous matter will have parted company with the gas. On the other hand, it may be said that this same tar acts as a most excellent lubricator of the machine. Moreover, placed here, next to the hydraulic, the chances of drawing in air are reduced to the minimum.

Against the second position for the exhauster, namely, between the condensers and scrubber, it is urged that the tar having in great part been removed, oil must be used for lubricating the machine, and sometimes naphtha must be employed to keep the apparatus in running order, while the only item in favor of this arrangement is that the extra cost—if there be any extra cost—of pumping the tar and aqueous matter is avoided.

The third situation for the machine—that is, after the washer—probably arose more by accident than design, for it is difficult to find any point in its favor, not also found in the second position, for it is open to all the disadvantages of the latter arrangement, and in addition places the washer under a vacuum.

With these points in mind let us attempt to weigh the evidence pro and con, and see which position offers the most advantages, or the fewest objections.

It is true, when the exhauster comes prior to the condenser, that the tar and aqueous matter accompanying the gas has to be exhausted; but were we able to place the cost of this work in pounds of fuel used, I think it would be found to be a small item. For, really, the amount of power required to drive an exhauster is not large. In 1877 Mr. Corbett Woodall, of London, made some experiments on the economy of different styles of engines for driving exhausters. From the record of the results he obtained we gather, that with the best form of engine, namely, the low pressure, compound condensing style, the consumption of coke in exhausting 1,000 feet of gas was 0.82 lbs. while the most extravagant figure was 2.11 lbs.—this was when using a horizontal, non-condensing engine. For corroboration of these figures we can turn to the record of the amount of fuel we use under our boilers in summer when we are using steam only for driving the exhauster, for we will find the weight of fuel properly to be charged to exhausting the gas is small.

We might take the figures obtained by Mr. Woodall, and after first ascertaining the weight of tar and of gas which would pass through the exhauster when placed before the condenser, calculate the proportion of fuel which should be charged up against pumping the tar; but I think such an arithmetical problem would have no practical value, because there are many conflicting factors which enter into the case, but whose value could not be determined with accuracy. Thus, if the light tar which is carried along with the gas to the exhauster forms, as before noted, a most excellent lubricator, how could we estimate its value? True, we could figure it in part from the cost of the oil and naphtha we would have to introduce into the machine when otherwise placed; but would this artificial lubrication—if I may use such a term—be as efficient as the oiling the apparatus would naturally receive from the tar? The method of oiling the cylinder of a steam engine, by having an oil cup on top of the cylinder, has justly passed into disuse, and in lieu of it we, so to speak, oil the steam, and thus carry the lubrication into every part of the cylinder and valves. And so in like manner with the exhauster, we would expect to find that the tar carried along with the gas would be more efficient as a lubricator than any other scheme we could devise, and hence the life of the machine, when so placed, would probably be increased. Thus it is clear that it would be well-nigh impossible to say, in dollars and cents, just how much the presence of the tar in the gas at this point would affect the balance sheet at the end of the year. Further, we must remember that the combined weight of all the tar and vapor would only be about two-thirds of the weight of the gas, and, of course, much of these products are deposited in the hydraulic main and pipe leading to the exhauster. Again, when the exhauster is well coated with thin tar the contact between the revolving blades and the body of the machine is practically perfect, so there is no slipping back of the gas; whereas, if the machine be perfectly clean, a small percentage of the gas has to be repumped. So I feel that though we cannot reduce the matter to a sum in arithmetic, yet the balance sheet is favorably affected by the presence of the tar in the exhausters.

Relative to the other two positions for the exhauster, namely, after the condensers and after the washer, there is little that can be said in favor of them, if our foregoing deductions are correct, for the only argument which has been advanced in favor of them is that the expense of pumping the tar is thereby avoided; but if the tar here is found to be a source of revenue—for a penny saved is a penny earned—then it leaves the advocates of these two positions for the machine on very weak props. For we can urge against either of these arrangements that they increase the possibility of drawing in air at some of the joints around the condensers, etc., and this liability is increased the further we get from the hydraulic; for if there is much friction or resistance in the pipes and apparatus between the exhauster and hydraulic it will be necessary, in order to maintain an even gauge in the latter, to have a considerable of a vacuum at the inlet of the former.

I am, therefore, constrained to feel that the first position for this appliance, namely, before the condensers, offers the most advantages and the fewest disadvantages.

In rearranging this part of the plant of the Lawrence (Mass.) gas works last year I took the exhausters from their location after the washer and placed them before the condensers; I certainly have had no occasion to regret the change. The machines work perfectly as now placed, and I cannot see that it takes any more power to drive them.

## The "Automatic Water Gas Process."

By Frederic Egner.

In a recent issue of the Journal* I perceived an item that alluded to the "Missouri Automatic Water Gas Company," the managers of which proposed to locate gas generators in the centers of the street blocks with the object of furnishing to the residents of St. Louis a supply of illuminating gas at a cost not to exceed $1 per thousand cubic feet to the purchasers thereof. Since it is not unlikely that future promoters, working under the same patents, may appear in other cities or towns of the States, it will therefore be of interest to the gas man, who is at present uninformed in regard to the "automatic water gas process," to hear something as to the nature of the system, with which he may at one time or another be called upon to compete.

On December 22, 1885, the Patent Office authorities granted to one Byron Sloper letters patent for a "Process of Manufacturing Illuminating Gas." The index number of the patent is 332,957, and copies of the document can be obtained by those anxious to secure them by remitting 25 cents to the Commissioner of Patents, at Washington, D. C.

The Sloper process is the one which is employed by the "Missouri Automatic Water Gas Company," and under its operations its promoters claim to be enabled to dispose of the product with profit at a sales figure of $1 per thousand cubic feet. The process itself is merely a combination of the well-known method of generating hydrogen, in decomposing water by the aid of zinc or other metals and diluted acid, together with the equally well-known way of forming carbonic acid, through the action of dilute acid on carbonate of lime—the latter being in the shape of marble or oyster shells. After the usual clause "I claim," etc., in the specification of patent No. 332,957, the inventor proceeds: "The process, herein described, of automatically generating illuminating gas, which consists in (1st) producing water gas by subjecting metallic scrap or turnings and carbonate of lime to the action of dilute acid; and (2d) carburetting the resulting gas with hydrocarbon vapor." It might be added that the hydrocarbon vapor is obtained from gasoline having a gravity of from 76° to 84°.

The showroom apparatus, as seen in the offices of the "Missouri Automatic Water Gas Company," consists of a wooden tank about 4 feet in height, and with a diameter of nearly the same dimension. In this tank is placed a copper bell, something after the fashion of an inverted wash-boiler; and within this bell are two other vessels, which latter may perhaps be most vividly described by likening them to kettles—one placed within the other. These kettles are open at their tops, but each has a perforated bottom. The outer kettle is said to be filled with iron scraps, and the inner one is supposed to

*See Journal, Sept. 2, p. 144.

contain the oyster shells. The bell, and the before-mentioned kettles as well, are suspended or supported so as to be quite a distance from the tank bottom, and are completely submerged in a bath of strongly acidulated water. It might be remarked, however, in modification of the last few words, that the liquid cannot enter the bell as long as the latter is filled with air or gas. Next we have a pipe, which enters the bell after the fashion of an inlet or outlet pipe of a gasholder, the open end being above the highest possible water line within the bell. Such is the design and construction of the generator.

Alongside the generator is located a copper carburetting vessel, which has a capacity equal to the reception of about one barrel of gasoline. The outlet from the generator pierces the carburetter, a valve between separating the two vessels. Everything being in readiness, the separating valve is opened, the liquid rises in the bell, and the evolution of hydrogen and carbonic acid begins. So long as the resultant gas is being consumed the process is continued, but as soon as the burner cocks are turned off the accumulation of pressure in the bell forces the water out of it, and the further generation of gas ceases.

The gas, as consumed in the rooms of the automatic company's present quarters, is burned through one and two cubic feet capacity burners, ranged symmetrically along the walls of the office, and the lighting effect is quite superior to that afforded from burners fed by an ordinary air gas machine, in that it is at once more stable and brilliant. The apparatus which bears no evidence of complexity, and the illumination make a very good impression upon the ordinary visitor; in fact the system is well calculated to deceive those who are not practically conversant with the art of gas manufacture. The ordinary commercial product sent out from the works of the old St. Louis Gas Light Company is exhibited side by side with the automatic gas, and the latter gains greatly from the nature of the comparison. The apparent gain is traceable to the fact that the automatic sample is consumed in the style of burner best suited to show its merit, while the old St. Louis Company's gas is caused to pass through the same burners. In consequence, the latter gas product is made to look sickly, simply because the conditions under which it is consumed are such as preclude a fair trial. Nevertheless, in justice to the exhibitors, it should be stated that very likely they do not understand or appreciate the unfairness of the test as it is carried on; for it is certainly my impression that the gentlemen who are in charge of the matter would not act in a wilfully deceptive manner. Still and all, the effect exerted on the mind of the visitor—who is not a practical gas man—cannot but be to cause him to believe that that which he has witnessed is beyond all doubt the fairest test possible. While it probably is so in intention, it is nothing of the sort in fact.

At the office of the company the promoters also show a small apparatus capable of supporting one burner. This one-burner power model is made of glass and metal, and is employed to demonstrate the principle of the system to would-be purchasers. In its working zinc is the metal employed; but as the evolution of one cubic foot of hydrogen will require the consumption of about three ounces of the metal, that particular plan is not likely to find favor with practical gas men. It is, nevertheless, a very pretty experiment.

The question, "What is the object of making carbonic acid with the mixture?" has no doubt occurred to the reader; and to it the automatic water gas people would answer that it was done for the purpose of giving density or weight to their product. But as the practical gas maker, in face of the expense he incurs or goes to for the purpose of ridding his product of that obnoxious ingredient, would fail to be convinced by that reply, the following—confessedly a mere surmise on the part of the writer—may be as near to the reason as anything else. Perhaps the Patent Office would not have granted letters patent to Mr. Sloper for his process but for the carbonic acid feature of the "invention." Surely no gas man worthy of the name would deliberately go to the trouble of making carbonic acid to mix it with his illuminating gas product! At any rate, that is the chief novelty of the Sloper plan—the apparatus for generating the water gas is far from new.

The principal cause of the apparent success of the "automatic water gas process" is more than likely due to the oil. Gas makers frequently underrate the value of that. The writer—using crude petroleum as an enricher for coal gas—has succeeded in obtaining 240 cubic feet of 21.5-candle gas per gallon of oil; and, besides that, increased a quantity of coal gas of 14 times greater bulk than that of the oil gas, from 16 to 21.5 candles. Hence it is not unlikely the high grade naphtha, and the warm weather conditions which prevailed at the time of my visit as well, had much to do with the excellent working and effective lighting duty secured from the labors of the "automatic water gas" plant. Indeed, the whole thing is so simple that anyone may "try for himself" as to what is the true cost of the gas product obtained under the process described.

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A Tell-Tale Paint.—Mr. H. Crookes, London, has discovered a tell-tale paint which will indicate when a bearing is growing hot. At normal temperature its color is brilliant red, but as it is heated it grows darker, until, at 180° F., the hue is a deep brown.

## Preservation of Wood.

Mr. G. R. Tweedie, F.C.S., contributed the following interesting article to a recent number of the London *Builder:*

The class of expedients which fall under the heading of superficial injection or immersion in antiseptic or other preservative solutions, differ essentially from those that have already been discussed, inasmuch as there is a certain degree of penetration into the pores of the wood of the solution employed.

In commencing the consideration of this part of the subject it will be desirable to direct particular attention to a fact too often overlooked by patentees—viz., that crystallizable salts, and especially those which absorb water readily, possess the great disadvantage (if the penetration of the wood be at all considerable, and if it be not considerable the employment of such salts is, as a rule at any rate, a very useless expense) of being liable to crystallize, thus causing a splitting apart of the firbers of the wood, and an increased tendency to absorb water in damp situations. There can be no doubt that those preservatives are most suitable that render insoluble and less putrescible the nitrogenous constituents of the wood, and that alter to the least possible extent the natural structure of the wood; and, moreover, a good preservative should possess no tendency to crystallize or to absorb water. Further, the perfect preservative should be insoluble in water, incapable of appreciable volatilization, especially in warm situations, and necessarily, of course, it should be a perfect antiseptic, and poisonous or inimical to insect life of every description. In addition to these qualities, it should not increase the combustibility of wood treated with it. How seldom these conditions are satisfactorily fulfilled will be understood after some of the principal processes have been passed in review.

Corrosive sublimate or chloride of mercury solution (one pound of the salt to five gallons of the water) has been employed with a measure of success in the process well known as "Kyanizing," though according to Boulton it has invariably failed, like all other processes which involved the use of salts of metals, when the treated woodwork was exposed to the prolonged action of sea water.

The action of the salt is to render unsoluble the nitrogenous constituents of the wood, and by its powerfully poisonous nature to prevent the development of spores of fungi or the attacks of insects. There can be no doubt that this material does increase the longevity of wood treated with it to a very considerable extent, especially when the wood is not constantly submerged. An experiment well illustrates this. Deal planks were exposed to most unfavorable conditions. In one year those that had been unprepared were rotten; those that had been "Kyanized" remained sound for seven years, and then began slowly to decay; whilst, it may be added, those that had been "creosoted"—a process to be described later on—were found to be sound after twelve year's exposure.

The corrosive sublimate can be applied either by injection or by simple immersion for from 7 to 21 days.

Although Mr. Kyan was the patentee of this once important process, the use of this salt in this particular direction was first suggested by Sir Humphrey Davy.

Dutrochet's experiments show that mercury salts were the most effectual in preventing growth of fungi; salts of copper, nickel, and cobalt come next; iron, antimony, and zinc seem to have little effect; whilst those of tin and lead were worse than useless. These experiments are not, however, by any means conclusive, nor does experience always agree with the results obtained.

Salts of zinc have been largely used. Sir William Burnett's process (patented 1836) involving the use of chloride of zinc, was at one time very widely adopted. The action of the chloride is to coagulate the vegetable albumen, and it is also, to some extent, inimical to the attacks of fungi and insects. In the original specification a strength of about one pound of the salt to five gallons of water was recommended, and the wood was to be immersed in the solution for from 10 to 21 days. A defect, shared by chloride of zinc in common with a large number of other metallic salts used in preservative solutions, is that iron and copper nails inserted in wood that has been treated with them are liable to rapid corrosion, especially if at all exposed to moisture.

The absorption of this and other preservative solutions is said to be much facilitated by taking advantage of the expansion of the wood by heating it to the highest possible point consistent with the avoidance of damage to its structure, and then plunging it into the bath of preservative, so that as the fibers cool and contract the liquid is, to some extent, sucked in.

Other patents involving the use of zinc salts are those of Boulton (Pat. 62, 1882) and of Roper (Pat. 3,761, 1882). In the former a combination of tar and tar products with naphthaline, chloride and sulphate of zinc, and alkalies is recommended. In the latter the wood is first impregnated with sulphate of zinc and then with chloride of calcium; in this way double decomposition results, the insoluble sulphate of calcium which is formed closing the

pores of the wood and locking in, as it were, the greater part of the chloride of zinc formed at the same time.

Sulphate of iron was patented by M. Bréant as a preservative of timber in 1837, and it enters into the composition of many patented mixtures. As recently as 1883 a method was patented in which the timber was first to be placed in a vessel with water heated up to 248° F., and then plunged into a mixture of sulphate of iron and chloride of sodium (common salt), or lime water and alum.

In another patent it is recommended first to boil the wood in a solution of gallo-tannic acid, and then with sulphate of iron; or injection may be employed in the place of boiling. An obvious objection to this process is that the wood is rendered decidedly acid, a condition which would favor its decomposition; whilst the tannate of iron formed, in conjunction with the nitrogenous constituents of the sap, would, especially in warm, damp situations, favor the development of destructive ferments.

The most effectual mode of applying this material is that known as "Payn-izing" (patented by Mr. Payne in 1841). This consists in first filling the pores of the wood with chloride of calcium, followed by the application of sulphate of iron. In this way the insoluble sulphate of lime is formed in the body of the wood, which is rendered impervious and as hard as stone. Chloride of iron takes the place of the sulphate, and is for the most part locked in the wood; but it is of comparatively little use, the chief advantage of the process being the hard resistant surface given to the wood.

Copper salts, alone and in combination with other materials, have been largely used, and with a moderate degree of success, though for submarine woodwork it cannot be relied upon, as it affords no protection against teredo; and in fact, wherever the wood is exposed to the solvent action of water, soluble salts, like the sulphates, are useless. It is likely, as Boulton points out, that sulphates of copper might be most usefully employed in conjunction with oily and bituminous fluids, or even with oils which do not possess great potency as germicides.

In Margary's specification the acetate and sulphate of copper are mentioned as suitable, one pound of whichever salt is preferred being dissolved in four gallons of water, the length of time of immersion being according to the thickness of the wood—two days for every inch being the recommended period.

The best mode of application, where the conditions are suitable, is that of Boucherie, once largely used in France, especially for telegraph poles, which consisted in connecting the newly-fallen timber at one end, or in the middle, by means of suitable pipes and connections, with a reservoir containing solution of sulphate of copper fixed at a height sufficient to enable the antiseptic to expel the sap from the timber and take its place. De Lafollye describes a series of experiments which were made with a view of discovering the change that sulphate of copper suffers when injected into green wood and wood in different stages of decay. Green wood absorbs large quantities of sulphate of copper, which gradually disappears without apparent change in the constitution of the wood. This observation, he remarks, leads to the assumption that the free salt, *per se*, is not the preserving medium, but that the antiseptic action is brought about by a certain quantity of the sulphate of copper having combined with the wood cells. This circumstance does not apply to wood in a partial state of decay; such wood when used not merely loses all free sulphate of copper, but the quantity of combined salt diminishes in accordance with the progress of the decay. As to the preservation of telegraph poles, De Lafollye further points out that young trees are more efficaciously preserved by the process than older ones.

In MM. Bazin & Hémery's patent the sulphate of copper solution is warmed to 60° or 70° C., after which the timber is immersed and kept heated for about twelve hours, and then, "in order to cause the solution to enter the pores of the wood, alternate currents of electricity are caused to pass through the wood by copper wires placed at either end of the timber and connected with a magneto-electric machine, or the logs may be merely thrown into an electrified bath. The wood becomes a conductor of electricity when heated, and the electric current will carry with it the chemical solution."

Another patentee recommends boiling the wood in a mixture of sulphate of copper, caustic potash, alum, salt, lime, and water.

As specially useful for protecting woodwork from the ravages of the white ant, a mixture of arsenic acid and carbonate of soda dissolved in water and added to a strong solution of sulphate of copper, has been patented.

Another patentee recommends the treatment of wood first with sulphate of copper and subsequently with chloride of barium, whereby the very insoluble sulphate of barium is formed in the pores of the wood, lessening the porosity of the wood and enabling it to retain a large proportion of the chloride of copper simultaneously formed. A further advantage is that the barium sulphate is poisonous, so that the wood would be less liable to the attacks of insects, etc.

Notwithstanding the comparative uselessness of salts of lead for preventing the decay of wood, various devices have been patented involving the employment of a soluble salt of lead, and subsequent treatment with a soluble sulphate and carbonate, whereby the corresponding insoluble lead salt is formed in the pores or on the surface of the wood.

Common salt and alum, together and singly, have been suggested as useful for the prevention of decay. The affinity of the former for water is a serious objection to its use, although in Holland in past times it was largely used for pickling ship timbers, etc., whilst the preservative influence of sea water is well known in the case of oak, the color of which it alters in many cases, as Mr. H. Maudslay has pointed out, to a peculiar green. Boiling sawed wood in carbonate of soda—a process which in the case of most woods would result in a serious disintegration of the fibres of the cell walls and a consequent loss of strength and durability—has been patented. In another process the destructive operation of boiling with carbonate of soda or other alkali is recommended, followed by impregnation with a mixture of liquefied resin and silicate of potash or soda (soluble glass).

In an American patent the wood is first treated with a solution of sulphate of soda or magnesium, and subsequently with barium chloride. The insoluble and poisonous barium sulphate thus formed is, of course, the preservative, by adding to the density and impermeability of the surface of the wood.

The use of the liquor obtained from saturated peat in its natural condition, and the filling in of receptacles, grooves, recesses, and holes, cut or bored in the timber, with poisonous and preservative substances, have also been the subject of various patents.

Very few of the above processes have any permanent value. In the majority, the preservative would be dissolved out of the wood by exposure in moist situations for a lengthened period. In a few the action is merely mechanical by closing the pores of the wood, whilst in not a few cases the internal constitution of the wood is so seriously modified that its structural usefulness is greatly lessened. A very large number of patentees seem to have been absolutely ignorant of the nature of the problem that they desired to solve. For example, compounds containing potash salts, phosphates, ammonia compounds, and urine have all been patented, the probable effect of which would be to increase the liability to the very evils it was sought to avert, inasmuch as all these substances constitute excellent foods for the dry rot and other fungi.

Superficial treatment with hot whale and other oils was in former years considered useful; but the animal and vegetable oils have entirely given way to the oily and other products obtained in the distillation of tar. As regards tar itself, application in the hot state differs materially, and is far more efficacious, owing to the greater degree of absorbtion, than mere brushing with cold tar.

Crude creosote or oil of tar, crude petroleum, resin oil, carbolic acid (either alone or in combination with other materials, such as pitch, resin, silicates of potash and soda), mixtures of naphtha and creosote mixed with resinous substances and soda, naphthaline in a hot or boiling condition, have all been recommended. With respect to naphthaline, considerable difference of opinion exists as to its utility; but Dr. Tidy considers that it is "of infinitely greater value than at first sight appears. It is somewhat antiseptic, but its special value lies in rendering the wood more solid. The objection that its volatility is against it is met by the fact, proved by direct experiment and experience, that this loss is but superficial and soon ceases." These remarks were applied to the value of naphthaline as a constituent of so-called creosote—the material which stands at the head of the list of wood preservatives. True creosote is the product of the destructive distillation of wood; but the article used for timber preservation is, to quote Tidy's definition, "a product of the distillation of coal tar after it has reached a temperature of about 100° to 120° F.; in other words, after what is known as the light oil has distilled over."

Bethell was the first to utilize this material, and the process of pickling timber with it was for long known as "Bethellizing" (Pat. No. 7,731, 1838). In the original specification, however, the word creosote does not appear, but combinations of saline solutions and resinous or bituminous substances; coal tar, thinned to one-third or one-half its own quantity of dead oil, to which if desired caoutchouc or resin might be added, were mentioned. The impregnation of the wood was effected in a strong cylindrical vessel, connected with a powerful air pump, so that by first producing a vacuum the pores of the wood might be opened, enabling, on the subsequent application of considerable pressure, the liquid to be forced into the substance of the wood. M. Bréant, in 1831, invented the first apparatus for injecting timber by means of alternate vacuum and pressure in a closed iron cylinder; but he employed as the preservative a mixture of linseed oil and resin. Another mode of "Bethellizing" consisted in first placing the timber in a heating chamber, and passing the products of combustion through it. When thoroughly dry it is taken out and at once immersed in hot creosote in an open tank.

Although Bethell's name is most prominently associated with the use of creosote, coal tar vapors had been used for preserving wood by Frantz Moll in England two years before Bethell took out his patent. Space will not allow of my entering into a full description of all the modifications and im-

provements in the application of creosote and coal tar products; but those who desire more complete information cannot do better than obtain the reprint of Mr. S. B. Boulton's most excellent paper "On the Antiseptic Treatment of Timber,"* read before the Institution of Civil Engineers, on May 6, 1884.

A brief summary, however, of the chief facts connected with creosote and its allies, so far as their application to timber preserving is concerned, will not be without value, and, indeed, this article would be singularly incomplete without it.

The complex nature of so-called creosote has yet to be completely unraveled, and varies considerably with the temperature at which the coal has been carbonized, and at which the subsequent distillation of the tar has been conducted.

The usefulness of the material, however, seems to depend chiefly upon the presence of the following materials:

Naphthaline. The importance of this material has already been referred to, and the most practical authorities now prefer those oils which are rich in it, examination of creosoted sleepers of considerable age having shown that this substance was present in abundance, whilst the more immediately powerful tar acids were absent. In fact creosoted timber, with plenty of naphthaline in it, will last far longer than that which has been treated with the much vaunted tar acids, to which all the credit of the preservation used to be given.

Acridine is one of the alkaloids in coal tar oils, of an intensely acrid and pungent character, a powerful antiseptic which, when once introduced into the timber, is not easily eliminated. Boulton is of opinion that it will come to be recognized as one of the most valuable constituents, for timber preserving purposes, of tar oils.

Carbolic acid, although much over-estimated in some quarters, is doubtless of considerable value, as, owing to its active properties as an antiseptic, it prevents the development of dry rot fungi and the attacks of insects in new timber. Owing, however, to its great volatility and the unstable nature of its combinations, its power in this direction is only temporary. The proportion that should be present in good creosote varies, according to different authorities, from 5 per cent. to 9 per cent. Tidy, on the other hand, considers that only just as much of the acid as may be required to coagulate the albuminous constituents of the wood is necessary; whilst Koch considers the acid to be of but little use, even as a coagulator of albumen.

Heavy oils, which are those which do not distill under 600° F., are considered to be of great value, their impregnating power being large, besides which they possess antiseptic qualities and are non-volatile.

The value of the above combination of materials, as found in creosote, is to be seen in the fact that eminent engineers have often preferred well creosoted fir wood to oak in hydraulic engineering, as being both cheaper and more durable. Creosote, however, requires both judgment and experience in its application, and has sometimes entirely failed in consequence of the imperfect manipulation of the timber, or its own poor quality.

The conditions which insure success are thus summarized by Tidy:

1. That the timber be well dried, so that the pores of the wood may be completely pervious.

2. The creosote should be of a heavy rather than of a light description.

3. That as much creosote should be put into the timber as the timber can be made to absorb.

One or two methods of impregnation have already been briefly described. In some cases mere superficial protection is given by thinning down the creosote with lighter oils and brushing the thin liquid over the woodwork.

One or two patentees have recommended the use of steam, either ordinary or superheated, mingled with vapors of creosote, carbolic acid, and similar substances, the wood being subjected to their influence in closed chambers.

In another patent the end of each piece of timber is left open to the air, so that the sap and moisture can be more readily withdrawn with the assistance of an air pump, after which creosote, etc., is injected.

When timber is new or wet the impregnation by alternate vacuum and pressure processes is imperfect, owing to the large amount of water present, and various plans have been devised for getting rid of this obstructive excess. It is fully admitted, as already explained, that naturally seasoned or dried wood is in every respect preferable to that which has been artificially desiccated. Still there are many cases where time is of so much importance that the six or twelve months of stacking necessary to render the wood sufficiently dry is quite out of the question. In all such cases the process of Boulton seems to be the most suitable, in which the wet timber is heated under creosote in a vacuum up to 112° F. (if heated to 250° or 300° F. deterioration of the wood will commence). The heat being imparted through the oily medium will not injure the timber, from which the water is volatilized and drawn out by the air pump. The creosote oils are not volatilized, as the temperature is far below their boiling point. The water is thus effectually removed from the wood and creosote takes its place.

* See JOURNAL, June 2, 1884, Vol. XL., pp. 270-71.

## Gas Motors for Tramcars.

The London *Journal* contains the following account of a paper on this subject, which was read by Mr. J. Danks, at the annual meeting of the Victorian Engineers Association, held in Melbourne, Australia, on the second of June last.

Mr. Danks introduced his subject by referring to a paper read by Captain Rowan before the Association a few weeks previously, on "Some Developments in Methods of Tramway Working"—a paper which he acknowledged had furnished a large amount of information, more especially as to the various efforts made to introduce electricity as a motive power for the purpose. But although these efforts had been continued from 1879 down to the present time, Mr. Danks thought that not one could as yet be pronounced a success. Passing on to consider the other means of propulsion which have been tried for tramcars, he remarked that the cable system would, no doubt, hold its own in the case of steep gradients, and where the streets were straight and the traffic was heavy. But its enormous first cost would, in his opinion, preclude its introduction where the traffic was light; and the great waste of power in keeping the rope moving, the wear and tear of rope, and the great number of other moving parts, led one to the conclusion that it was not by any means all that could be desired.

As for steam motors, he considered them to be eminently unfitted for working street traffic; one great objection being their weight. He pointed out that there must of necessity be in the construction of each motor a steam boiler, made of strong plate capable of resisting pressure; a quantity of water in the boiler, and a supply carried to replace what was used; also a supply of fuel. These, together with the mechanism and fittings of two steam engines, made the total weight of one of the Sydney motors, according to information he had received, about 12 tons; and this was carried upon four wheels.

It was when talking over this matter, and comparing the great cost (with its labyrinth of ropes, wheels, and heavy machinery) of the cable system, with the heavy engines used in Sydney, that it occurred to Mr. Danks and his coadjutor (Mr. Barnes) that by the application of a gas engine and a quantity of gas stored under pressure and carried to keep the engine supplied, a motor could be made to work tramcars on roads of ordinary grades as effectually as the cable, and with less than one-third the weight of an ordinary steam motor. They put their ideas into shape, and found that by the application of friction gearing for giving motion to the wheels, they could allow the engine to continue working in one direction, and so avoid the delay of stopping and starting. They then proceeded to perfect their arrangements, which will be best described in Mr. Dank's own words: Having matured our plans and obtained the consent of the Railway Commissioners to use the Alphington line, we procured a 3½-horse power "Otto" gas engine, and constructed the experimental car which the President described at the last meeting. The President was greatly interested in our first gas tramcar. We invited him to inspect and test it in any way he thought proper, and we placed it at his disposal for the purpose. He took great pains in experimenting and making notes of its performances, and very kindly furnished us with the result of his investigation, a copy of which, with his permission, I will now lay before the members of this association.

During a period of some ten weeks we ran a number of experimental trips, and exhibited it to all who wished to see it. Being anxious to put our invention to a more practical test, we entered into an arrangement with the Government to carry passenger traffic and to work the Alphington line as a tram line. Under the arrangement it was stipulated that we should supply a motor that would draw a carriage in which the passengers should be conveyed. For this purpose we constructed a new motor with a 6-horse power engine, and fitted with friction gear similar to our first experiment. The motor weighs 4¼ tons, and the carriage 35 cwt.; making a total of 6¼ tons without passengers. The supply of gas is carried in four copper containers, each 16 inches in diameter, and about 6 feet long, which were tested by hydraulic pressure, before being used, to 200 lbs. per square inch. The total cubical capacity of the four containers is 28 feet. These containers, charged with gas, compressed to 10 atmospheres, or, say, 150 pounds per square inch, represent 280 cubic feet of gas stored, which is sufficient for a run of 15 miles. We have never yet exceeded the pressure of 100 pounds, which we find gives ample supply to carry us to Alphington and back twice. For compressing the gas we have an engine and compressing pumps fixed near the line. With this we take the gas from the Metropolitan Company's main, and force it into receivers, where it remains under pressure until required for use. When the motor requires a fresh supply of gas it is brought opposite the receivers, and the containers on the motor are connected by a short india-rubber hose to a pipe leading from the receivers; a tap is then turned, which allows the gas to pass from the receivers to the containers until the pressure is equal, when the tap is closed, the hose disconnected, and the motor is again ready to resume duty. The time required to charge the containers does not exceed two minutes. The engine, compression pump,

and receivers need not be near the line; they may be placed 100 or 200 yards away in any convenient place, and the gas under pressure led to the line through a high-pressure pipe. The time usually taken in running the whole distance (some 2½ miles) is about 16 minutes, and the same time is occupied on the return journey. The heaviest gradients (of which there are three) are 1 in 50; and the sharpest curve is 18½ chains radius. The number of trips run each day is eight, or a total of about 40 miles per day, except Saturday, when an extra trip is made. The motor has now (June, 1886) been working about four months, and the average consumption of compressed gas is 702 cubic feet per day, as measured by the meter through which it is taken. The tram-wheels are two feet in diameter, made of cast iron, chilled, and cast from a pattern discovered at one of the foundries. The friction wheels are also of ordinary cast iron, and are actuated for going forward, going back, or stopping, by the movement of one lever. The motor runs round the carriage at each end of the line. We have, on one or two occasions, had as many as 40 passengers at one time; but I regret to say good loads are very much the exception; the travel on the Alphington line at this time of the year being very light. The repairs up to the present time have been almost *nil.*

Captain Rowan finds it hard to believe that it will ever be possible to make gas effective as a motive power for tramways, and says: "But we must remember this, that it is not the first time that gas has been tried on tramways. It was one of the earliest things tried in the way of mechanical traction. It has never succeeded; and therefore I find it hard, without further evidence, to imagine that if the problem could be solved in this simple manner it should not have occurred to somebody before." This sentence seems to me somewhat curious. If gas has been tried before it is very singular, when so much interest is taken in the subject, and when every particular of any trial by electricity is carefully recorded, that there are no records to be found of trials by gas. I can only say that Mr. Barnes and I tried all we could to find such records; and when we could not, like Captain Rowan, we wondered that it had not occurred to somebody before. And as to the doubt of its ever being made to work successfully on tramways, I will ask how it is that we are all so sanguine as to the success of electricity? I do not profess to be an electrician, but I have always been under the impression that to produce electricity an expenditure of power was in some way or another necessary, and that it is rather an agent for transmitting power than for developing it. Can you point to an electrical engine that is economically driving a printing machine, a planing and moulding machine, or a factory where even sewing machines are used? I do not know of one. Yet there are thousands of instances where the gas engine is performing all kinds of similar work; and hardly a month passes without our seeing some account of its being made still more effective. The power of the gas engine is derived from a fuel which has no weight—of which a large quantity can be carried without adding to the load, and the supply of it, as has been shown, can be replenished with the greatest ease. No boilers, coal, or coal bunker is required; and one man—not necessarily a mechanic—is all that is needed to take charge. It is true that the motor we have working is running upon a railway; and there may, and no doubt would be more power required to work it on a street tramway. This, however, appears to be but a question of a larger engine. If a 3-horse engine will not do the work, then try a 6-horse; and if a 6-horse will not do it, then try a 12-horse. It is only a question of more power and a larger expenditure of gas, which the President has shown is not a matter of great importance. The fact of our having run a motor 40 miles a day for four months has, I think, established the principle, and has proved to demonstration what can be done.

It is always an uphill fight to get a thing of this kind introduced, and making experiments and trials for the purpose of bringing it under the notice of the public necessitates a large outlay. We have, however, no doubt of its practicability; and we have every confidence that we shall ultimately see it working successfully as a street tram motor.

At the close of the paper the President offered a few observations thereon, which, in view of his having made the subject under consideration a special object of investigation, may be reproduced *in extenso:* Although I am interested in electricity, and should very much like to see it carry all before it, still I cannot shut my eyes to facts; and I must say that, as far as I can see, the facts are very favorable for Mr. Danks' scheme. It was with interest and pleasure that I conducted some trials with his original gas car twelve months ago. The newer and larger one at present running I have not had an opportunity of traveling by; but what I have been able to arrive at from calculations on the subject seems to me very favorable. My theoretical calculations correspond very closely with Mr. Danks' practical results. The point is this: You have a car capable of carrying 40 people, and this car runs 40 miles on 4s. worth of gas. Passengers in tramcars generally pay 1d. a mile each; so that if (as Mr. Danks would like to see it) his car were full of people all the way, and they paid at the rate of 1d. a mile, this would bring in 1600d.—just about £7; and the gas consumed would not cost 4s. This bears out the remarks I made on a previous occasion—that the cost of gas for driving this car was trifling; and that even if you could do away with it altogether, and drive the car by perpetual motion, the amount saved thereby would be hardly worth mentioning. The comparison between different systems of tramways must be in the cost of attendance and the maintenance of the mechanism; and in these respects Mr. Danks seems to show a very favorable return. The cost of attendance on this gas tramcar is very slight, because it does not need a skilled driver, while a steam car does; and the maintenance of the mechanism is practically nothing. I have had experience with gas and steam engines, and, as far as my experience goes, with steam engines this latter item is less favorable. A gas engine will keep in order a long time without deteriorating. In the course of the last few years I have had to do with a gas engine and a steam engine—the former working longer hours than the latter—and yet the steam engine has already knocked its cylinder cover out, and considerable corrosion has taken place in the cylinder, which has a large leak in it. The gas engine, on the other hand, although it has been working a long time, has had nothing done to it except having a new piston-ring. A rough calculation I made to-night shows these results:—1,000 cubic feet of gas can be stored in a properly-made reservoir which will not weigh more than a ton. This will exert 1-horse power for 40 hours in a gas engine of moderately-good construction. I have in my possession a document certifying that a gas engine working with 23 cubic feet of gas gave 1-horse power per hour. This is an enormous amount of power to "bottle up" in a small amount of weight. You can apply it in all sorts of ways. You can have 40-horse power in one hour, or 1-horse power for 40 hours. I hardly know how you can carry a greater amount of power stored up than by this means. You get ten times as much power from the gas on the car as it takes to compress it. These, then, are the facts: That the cost of running this car is perfectly trivial; that, in fact, you may say one passenger's fare will pay for all the gas consumed. You do not need skilled attendance on the car; and, as far as can be ascertained, the mechanism is very durable. With these three points in its favor, it seems to me that Mr. Danks' car should have a future before it. I must say that for my own part I wonder that more has not been made of this method of driving tramcars by gas. Captain Rowan's objection I understand to be that there must be some great difficulty in connection with it, or it would have been done long ago. But, as we know, Mr. Danks' gas engine has been working a long time, and I believe no objection has yet appeared; and I do not know, therefore, what it can be. Altogether, the performance seems a very promising one. Of course, where there are steep gradients, a greater amount of power is required; but you can have a larger engine. That would not mean any serious consumption of gas. Or a second way would be to have another double gearing. This unquestionably would enable the machine to surmount an ordinary incline. If you were running 10 miles an hour on the easy part of the road, you could go up the incline at the speed of 5 miles an hour. At any rate, these are facts with reference to Mr. Danks' gas motor. I do not think that there is anything more to be said about it, except that it seems to be quite free from nuisance. In the experiments with the first car last year I did not notice a smell of gas about it; and in the present car the noise has been done away with. It really seems as if there were no valid objection to the machine, and a great deal in its favor. That is all that can be said of our knowledge with regard to it at the present time. I look forward with interest to further development of the subject. It seems a matter of regret that it should be working in a place where nobody appears to want to travel.

Some interesting facts came out in the course of the discussion on the paper. A question was asked as to starting the engine; and Mr. Danks replied that it was started in the usual manner—a man pushing the wheel round. A new way had, however, been introduced for starting these engines—viz., by having a small engine fixed to the friction wheel, and as this engine started so did the larger one. They only stopped once a day, because the quantity of gas consumed was so small as to make it not worth while to stop. A member expressed some doubt as to Mr. Danks being able to beat the steam engine with gas; and he instanced the case of an engine working in Melbourne on 2½ pounds of coal per horse power. The President said it could not be a 4-horse engine. This the member admitted; but he contended that, with a small engine, designed on the same plan as the larger one, the principle would be the same. The President, however, ventured to differ with him. He would not admit that a steam tram motor could be run on 3 pounds of coal per actual horse power per hour; but he would admit that, with everything in good order, it might be done with 5 pounds. At this rate the coal for the steam motor would cost ¼d. per horse power per hour; whereas the gas for a gas engine would cost 2d. per horse power per hour. The gas cost four times as much as the coal. If they were going to have an engine of 100-horse power, this difference would be a serious one, and nobody would at the present time put a 100-horse power gas engine as against a 100-horse power steam engine. But when they came to the cost of the tramcar, they must remember that the gas motor could be managed entirely by one man or a lad, who need not know how worked; whereas the

steam engine would require probably two men—at any rate one skilled man. If they took into account the difference in the wages paid to the skilled and to the unskilled attendant, they would find it would balance the difference in the cost of the two kinds of fuel.

After all it was sometimes worth while working rather wastefully when by a small waste a big saving was effected. It was evident that in the tramcar question the cost of fuel would not turn the scale. The gas, steam, or electricity for a car holding 40 or 50 people, running on a moderately level line, would cost 1d. per mile. In all these cases the question did not turn upon the cost of the fuel, but rather upon the reliability of the machine, the cost of looking after it, and of the maintenance of the machinery, the absence of nuisance, smell, smoke, and so on. He recommended the gentleman who wished to know how the engine was stopped and started to take a ride on the car. He would then have an opportunity of witnessing how this was done. Nothing could be easier. It was simply one small handle that did everything, and this handle a child could work. He closed the discussion by stating that he hoped to be able at the next meeting to give some figures as to the comparative c st of working tramcars by electricity, steam, and gas.

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The following is the report of the President, to which reference was made by Mr. Danks in his paper:

"Volume of containers, 22.2 cubic feet; pressure at starting, 66 lbs. per square inch (22.2 cubic feet at this pressure is equal to 97.7 cubic feet at atmospheric pressure); pressure at end of run, 32 lbs. (22.2 cubic feet at this pressure is equal to 47.4 cubic feet at atmospheric pressure); total consumption of gas 50.3 cubic feet at ordinary pressures; distance traveled, 2 miles, 26 chains, 43 links, and back; consumption per mile, 10.7 cubic feet; time occupied in whole run, 30 min. 15 sec.; average speed, 9.28 miles an hour.

"A special calculation of speed power and efficiency while ascending a grade of 1 in 50, seven chains long, gives the following results:—Speed, 7 chains in 44 seconds, or 7.18 miles per hour. Work done in overcoming ordinary resistances computed at 10 lbs. per every ton of load on a total load of 4¼ tons per car and 19 passengers = 20,800 foot pounds. Work done against gravity in ascending incline = 92,000 foot pounds. Total work done, 112,800 foot pounds. Average pressure in cylinder, 51.6 lbs. per square inch; work done in cylinder at 200 revolutions per minute, 151,400; efficiency of mechanism, 112,800 ÷ 151,400 = 74 per cent.

"I note that the average pressure in the cylinder (51.6 lbs. per square inch) is decidedly less than what diagrams taken from the gas engine at the Melbourne University show. There we obtain 60 to 70 lbs. at 160 revolutions per minute. Whether this is due to the higher speed or to the effect of compression on the gas, I am not prepared to say. The efficiency of the mechanism is remarkably high. That there should be so small a loss—only 26 per cent.—for all the friction of the engine and gearing is most satisfactory, and promises a very long life for those parts; for when there is so little friction, there must be but little wear.

"I ought to add that a strong north wind was blowing, and as a considerable part of the length of the line runs nearly east and west, there must have been an unusual amount of flange friction against the rails. This, in my opinion, accounts for the fact that the consumption of gas was 10.7 cubic feet per mile, whereas, at a previous experiment, on a calm day, it was only 9.1 cubic feet."

## What Machinery Does.

A writer, in a recent issue of the *Western Manufacturer*, in commenting on the above-named subject, asserts that there are men still living, and some of them may be met with on the streets of Chicago to-day, who remember the time when the laboring classes were in a comparatively helpless condition. They lived poorly, were awkwardly clothed, their garments of the coarsest material, and were content with fare limited in quantity and meager in quality. In the sense in which we to-day understand popular education it was then unknown. The time of which we speak does not extend back to a period over 65 or 70 years ago. The workingman gained from the soil a scanty living, or toiled hard to produce it in ill-ventilated factories, aided by the rudest tools and devices; and when his wise fellows sought to lighten his task by labor-saving machines, he fought against them precisely as some men do to-day, and with his own hands strengthened his shackles and renewed his fealty to honest manual labor without the aid of any new-fangled machinery, which he regarded with suspicion, and did not care to understand. One of the peculiarities of those days, however, was that the laboring man did not fly off at a tangent and enter upon a strike. There were no combinations formed then, not in this country at least, to compel employers to advance wages, or to dictate to an employe what he should or should not do.

The laboring man and mechanic struggled upward slowly, and was convinced only after he was defeated. Argument did not make him give up his prejudices, but facts did. When it was shown to him that a cotton gin could clean more cotton and do it better than his own hands, he very reluctantly admitted the fact, but denied the general application of it. He fought every improvement in his condition as he would have fought an enemy, and not until his generation and succeeding ones had passed away was he slowly educated into the knowledge that machines could do more work and do it better than his hands. He regarded all labor-saving machines as so many enemies, eating up the bread of himself and his children, and crowding him out of the world, when the fact was then, as now, that they are his truest benefactors; instead of depressing his condition they elevate it; instead of decreasing the demand for his services, they increase it.

Directly and indirectly, in a hundred diverse yet directly traceable ways, machines have been the truest friends of the human race. Men lose sight of these facts in the whirl and bustle of life. They accept the spectacle of the locomotive in place of the stage coach, the steamer instead of the sailing vessel, the telegraph in lieu of the mail, the modern Winchester rifle as a substitute for the flint-lock musket, and yet fail to see how greatly these inventions have added to the blessings we now enjoy. By the development of the industries of this country, and not through the efforts of politicians, America stands the leading nation on the earth. The advances made in the past 25 or 30 years are truly wonderful, even to the expert; and what must they be then to those whose avocations lie elsewhere, and who know little of what is taking place in mechanics.

It is now possible to construct a complete sewing machine in a minute, or sixty in one hour; a reaper every fifteen minutes, or less; three hundred watches in a day, complete in all their appointments. More important than this even, is the fact that it is possible to construct a locomotive in a day. From the plans of the draughtsman to the execution of them by the workmen, every wheel, lever, valve, and rod may be constructed from the metal to the engine intact.

Every rivet may be driven in the boiler, every tube in the tube sheets, and, from the smoke stack to the ashpan, a locomotive may be turned out in one working day, completely equipped, ready to do the work of a hundred horses. This is only possible by the use of machines, guided and controlled by human intelligence, by a close system of supervision, and accurate economy of time and force, and a thorough knowledge of business. As the number of machines annually produced, and the mechanical facilities for making them are increased, statistics show that the number of workmen is always augmented. Machines do not supplant workmen, but create a demand for them. If a workman is taken away from one position it is only to find employment in another contiguous one. The opponents of machinery may say that if machines had not been employed more men would have been needed; but it is easy to see that the production would decrease, fewer machines would be made, and fewer men needed to make them; for it is the province of the machine to supplement man's labor, to elevate him and to increase his earnings, instead of the reverse. A man with a pair of stocks and dies may cut, by hard labor and a low rate of wages, one hundred five-eighths of an inch bolts in one day; but give him a modern bolt cutting machine, and he will cut four thousand bolts per day, and cut them better than with his hands alone.

The machine shop is one of the promoters of civilization. The arts of politicians are subordinate to it. Without the aid given by machines their schemes would fall dead; without the locomotive, and printing press, and the telegraph, they could not reach the ears of men in certain lines of thought. The ability to design a machine that will execute with automatic precision any given form requires a special development of brain power, and this development is by no means confined to the operator, but is shared by many persons. One machine leads to another, and as a consequence the intelligence of men turning out machinery of a high class is very marked, although they are unknown, for the most part, except locally. The machinist speaks through the work of his hand and brain. He adds to the population of the world when he sends forth a machine capable of increasing its working force; he frees his fellows from the bondage of mere handwork, and sets them higher problems to solve. In every way he advances the cause of his race, and leaves the world richer by his labors.

## Lacquering.

Mr. W. N. Brown, who has furnished a most interesting series of letters on the subject of the renewal of brass work, to the columns of the *Plumber and Decorator*, thus speaks on the item of lacquering: Burnishing having been disposed of, I pass on to the third division of my subject, viz., that upon lacquering.

For this portion of the work under notice a lacquering stove is the principal article required. This is formed of a sheet of stout iron, turned down all round, which is supported upon four legs, and beneath which is placed two or more jets—according to the size of the heating surface—which are fixed sufficiently low—between 4 and 6 inches being a good distance—that the

flames will heat the stove and the work upon it without either burning or smoking. Each of the jets must be provided with a cock, as a full flame or flames will not always be required. Besides the stove, which any handy man can easily and cheaply construct for himself, especially a gas fitter or iron worker, some lacquer, in various degrees, pale, deep, medium, brown, and red, will be required, a pair of pliers, with which to hold the work, some pieces of tapered round wood on which to fix circular pieces while in process of lacquering, sone gallipots, and some lacquer brushes—a brush and a gallipot being kept specially for each description of lacquer. All these materials, the gallipots excepted, can be procured at one and the same place, some metal warehouses keeping lacquer brushes, etc., and certainly all varnish and chemical manufacturers, and the cost will not be great. The lacquers can also be purchased in as small a quantity as a gill, so that there will be no necessity for any of my readers to go to any great expense in the purchasing of materials. Before being used the lacquer brushes must be tied up, soaked and dried, as this makes them last twice as long, and at the same time makes them softer than would otherwise be the case. Certainly they should never be taken straight from the warehouse and used for lacquering purposes; if so, fallure will be the only result. The gallipots, for which those used for jam answer admirably, must also, before being employed in brass finishing, have a piece of copper wire tied round and over the top, on which latter the brush must be drained of its superfluous lacquer—as each coating of the varnish must be thin and even, and consequently if placed on too thickly the work will be streaky. I shall, however, refer to this more fully presently.

I will now imagine that the iron plate or stove has been fixed, and the gas beneath tested, the various materials procured, and that all is in readiness with which to make a start upon some waste pieces of brass work, these being far preferable to trying the 'prentice han' upon work which is of consequence, such as would be the case with portions of a chandelier, vase, or what not belonging to a customer. Any old pieces of brass, which have, of course, been dipped, etc., as previously described, answer the purpose admirably. Now place the pieces upon the plate, covering them over with a newspaper, as this will tend to keep in the heat; next pour some lacquer out into one of the gallipots—not too much at one time, test the brush in it, and then by means of the pliers take up a piece of the work, and proceed to lacquer it evenly and carefully all over. Care must be taken that the metal is not too hot or burnt, and equal care must also be exercised that it is not too cold; still a little experience will soon enable the operator to ascertain when the requisite heat has been obtained. This is the case when, on touching it with the wet lacquer brush—which on no account must be too full of liquid—it hisses, when it should be evenly, lightly, and quickly covered over with a coating of lacquer. This work must be neatly and cleanly done, as if too cold, or too much of the lacquer be used, the work will be streaky; while if the metal be too hot the work will be burnt. When one coating has been put on the piece of work can be again placed upon the iron plate to get a second time hot, covered over with a newspaper as before, and a second coating applied, and so on until the proper degree of color or shade has been acquired. Great care will have to be exercised in this in order that each of the pieces match in color when placed together, and it is for this reason that a good light, northern, if possible, should always be selected for the lacquering stove. For the same reason it is always better that the work be done by daylight, and I may also mention here that, as a rule, especially for the better descriptions of work, women make far better lacquerers than men, for the reason that they have a light and quick hand, with a consequently delicate touch. Although lacquering may appear to an onlooker very much like ordinary painting, still such is not the case, and deftness in the application of lacquer is only to be acquired with patience and practice, and in all probability the first efforts of a workwoman—I advise my readers to employ a woman or young girl to do this portion of the work—will be failures—necessitating a reboiling up and redipping before relacquering. The work must not be hurried, but care and attention paid to it, for which it will in the end amply repay the expenditure. Of course, after the second layer has been applied, if the color is not sufficiently deep, the work must be again placed upon the stove to get hot, and a third layer applied, till a proper density has been secured, but two coatings will, as a rule, be found sufficient. I must also here impress upon my readers the absolute necessity of having the lacquering operations pursued in a room or shop totally, or at least as much as possible, free from dust, as, owing to the sticky nature of the lacquers, small particles of dust are liable to stick to the work, to its consequent disfigurement, and the work being then finished, these blemishes are difficult to remove, and as a fact, can only be so removed by means of lacquer, which, it is needless to add, increases the color of the work perchance more than is required. Keep all the various lacquers corked up; do not put out more than will be required; do not mix them, and do not occupy too long a time over the actual operation of lacquering, as the work—owing to its cooling, and that unequally—will, in all probability, turn out streaky; also do not agitate the lacquer, or dab it on or into the work, but place it on in an even, gentle and quick layer all over, the brush being just wet all through the hairs, and that only.

The remarks respecting quickness of manipulation and lightness of touch apply with increased force when engaged in the lacquering of bronzed work, as, in this case, if the brush is rubbed too much upon the bronze this latter is likely to be rubbed off, and the work decidedly not improved thereby. A great point to observe in all brass finishing is not to handle the work more than is absolutely necessary, and this must be particularly remembered in the case of bronzed work before and while lacquering, and in the case of burnished metal after it has been burnished up. With the directions given, combined with diligence and patience, and a determination to succeed, I see no reason why my readers should not be able to do the work treated of themselves.

## SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Sept. 17, 1886.

*Ammoniacal Liquor as a Fire Extinguisher.—Gas Consumers' Grievances.—Retort House Firing with Breeze in France.—Two Remarkable Gas Undertakings.—Balloonists and Scotch Gas.—The North British Association of Gas Managers.*

It has long been known to tar distillers and others having to do with gas products that crude ammoniacal liquor, as it comes from the gas works, is much more effective for extinguishing conflagrations than ordinary *aqua pura*. Cases are on record showing that it has been applied with great success on the occasion of accidental ignition of tar or pitch in tar works. But, strange to say, this fact is unknown to the general public. Consequently, when it was practically illustrated at Lewes a week or two since, they were taken by surprise. Fearful and wonderful explanations of the power of "gas water" in checking the progress of "the devastating element" have embellished the columns of our local news sheets; and they are, for the most part, written by persons unembarrassed with "even a little knowledge" respecting gas manufacture and gas products. (How easy it is to write about things of which we are entirely ignorant.) On the occasion under notice an alarming conflagration had broken out in a large block of buildings some eighty yards in length. The firemen, as usual, were busily and bravely plying their pumps and hose, but apparently against overwhelming odds, as no reduction in the violence of the flames was evident. At this juncture Mr. John Hammond, the manager of the gas works—who had probably heard of the property above stated, being a deep student and hard worker in the field of gas purification, and patentee of a scheme for rendering gas "self-purifying"—had a quantity of ammoniacal liquor brought up to the scene of action and supplied to the fire engines. Two hundred or three hundred gallons were so used with a decisive effect that deeply impressed the spectators. The pungent and villainous odor produced also had a strong effect on them—but this, by-the-way. The result is that numerous suggestions are forthcoming as to the advisability of keeping tanks or barrels charged with ammoniacal liquor in readiness at the fire engine stations. So the example set by Mr. Hammond may be commended to the attention of gas engineers in general, as opening up a novel, if not very extensive, field for the employment of ammoniacal liquor.

A glance at the principles concerned in this property of the liquor may not be uninteresting. The effect of throwing it upon flames will be the practically instantaneous evolution of the impurities it contains in the gaseous form. A gallon of liquor of ordinary strength will produce some 8 cubic feet of gases, consisting of about 4 cubic feet of carbonic acid, 3 cubic feet of ammonia, and 1 cubic foot of sulphuretted hydrogen. Carbonic acid is known to be an active extinguishing agent, and the other gases, though slightly inflammable, serve to smother the combustion by keeping the air away from the burning material. This principle of using strong solutions of carbonic acid or ammonia carbonate for fire extinction has been applied for many years. So it is easy to see how the application of even small jets of liquor will have a great effect in fire extinguishing, and that the suggestion as to keeping a few conveniently portable tanks filled with it in readiness to be taken out with the fire engine is a good one.

People who are inclined to think that all gas consumers' grievances are traceable to the profits made by the companies who undertake the responsible duty of maintaining the supply, will do well to study the case of Leeds. There the gas works have been bought up by the town authorities, and, owing to an exceptional combination of fortunate circumstances, they are able to supply gas at the low rate of 44 cents per 1,000 cubic feet, exclusive of a scale of discounts. Some time ago they talked of leaving the street lamps burning continuously during the dark months, as the extra consumption of gas would not be so costly as the lamplighters' wages thus saved, and the lamps would always be in readiness for sudden fogs. So, if there is a gas consumers' paradise upon earth, wherein grumbling is no more, it should be at Leeds. But what are the facts? In the local papers we find com-

plaints that the gas is adulterated with air. One sapient individual states, with an amusing assumption of knowing what he is writing about, that whereas the late manager was satisfied with putting 10 per cent. of air into the gas, the present ones go up to the intolerable proportion of 25 to 30 per cent. This shows to what extravagant lengths people with a grievance will go when ordinary channels of fault finding run dry.

At the recent meeting of the *Societie Technique de l'Industrie du Gaz en France*, two members contributed papers on the subject of utilizing breeze and small coal for heating the retorts. With the rapid increase in the production of coke in England it is difficult to secure a sale at good prices, and therefore gas engineers are not inclined to look with favor upon any scheme which will enhance their difficulty by increasing the quantity to be disposed of. This is just one reason why many of them look askew at the generator furnace system. "Oh," says Mr. Go-a-head, "develop a demand for your coke." But still the hard fact remains that the price obtainable is largely dependent upon the quantity to be disposed of. Take the case of the Gas Light and Coke Company, who only average something like one dollar per ton for their coke. Still the demand for smokeless fuel is increasing, and the public are getting more and more acquainted with the value of coke as a fuel both for domestic and manufacturing purposes. So, although many are inclined to regard the possibility of such a demand for coke arising as to render it advisable for attention to be directed to the use of breeze or small coal in the retort house as a utopian notion, it is well to keep an eye on all that is being done, and even to encourage research in this direction. Of course, in France and other parts of the world where coal is much more costly than in this country the coke should have a proportionate marketable value, and the breeze question assumes increased importance. We must also remember that coal is not likely to get cheaper here, in the face of the increasing demand for it. Limits of space forbid entering upon any detailed description of the furnaces by means of which M. Pot and M. Petire, the two gentlemen above mentioned, have been able to show satisfactory carbonizing results from breeze firing. The former gentleman uses a "Jones" furnace, as described at the last meeting of the Gas Institute.

I hear of two gas undertakings that are at present occupying most unenviable positions. The first is the Partick, Hillhead and Maryhill Gas Company, in Scotland, whose directors have suddenly awoke to the unpleasant fact that their stocks of coal, coke and lime, instead of being worth £16,000, as shown by their books, are actually only worth £5,000. After adjusting this little deficiency of about £11,000 there remains not only no profit but a heavy loss on the half year's working. For the consolation of the shareholders the directors point out that the loss is exceptional (let us hope so), and that they will have a dividend next half year, as usual, for the concern is in a prosperous condition. They seek to shelve the responsibility of the error on their late manager, but directors are not appointed for the purpose of blindly accepting reports from their managers. Naturally the shareholders are not inclined to accept the promise of better things to come as a *solatium* for their usual dividend check. (I should prefer the check myself.) But it shows a beautiful innocence, quite childlike, to call this loss exceptional. Little discrepancies to the amount of £11,000 or so in the books certainly should be *very* exceptional. Indeed we might go further and say that such a state of things is unique.

The predicament of the second undertaking, that belonging to the Darlington Corporation, is also not without an amusing aspect. This astute body, after worrying a competent manager till he "went to a better place" (he very sensibly got another appointment at a better salary and then resigned), held several animated discussions as to the appointment of a successor. In the course of these debates the proverb referring to the "multitude of councilors" was not realized; for the outcome was that they decided to do without any manager at all. Their borough engineer, who candidly confessed that he knew nothing of gas making, and did not seek the office, kindly consented to accept the position of gas manager without any addition to his present salary. The next phase of this affair is that the newly fledged gas manager found the trifling drawback of "knowing nothing of gas making" to be rather an inconvenience, so applied to the Council for a "competent assistant." Here is an opportunity for aspiring young men. They will virtually have all the responsibility attaching to the office, with none of its dignity, and about half the usual emolument. Serving under a chief who "knows nothing" of the peculiar branch of knowledge requisite for his position, the "competent assistant" will probably enjoy the position of being made "scapegoat" for anything that goes wrong, whilst his superior officer will take credit for the other side. He may even be able to so thoroughly "coach up" the borough engineer as to make the latter a better gas manager than himself, and possibly find himself thrown off as soon as his master feels able to float without aid. Notwithstanding the statement in Council that a chimney had nearly tumbled down, a boiler nearly blown up, an explosion been barely prevented, 10 per cent. more labor was employed than was necessary, a loss of about £30 weekly in the carbonizing department, and one or two other trifling matters, it was alleged that the "assistant" was not wanted. The men at the gas works had been there for 20 years, and knew what they were about without any overlooker. However, the "assistant" is to be appointed. It seems to me that the Darlington Corporation are taking lessons, like Thomas Carlyle, in the school of experience, and also that, like him, they will "find the school fees very high."

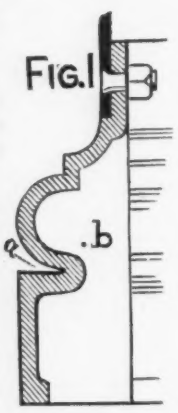
Balloonists who depend upon the gas works for the necessary expansion of their oiled silk and network are placed at some disadvantage in Scotland. The ascensional power of a balloon is proportionate to the difference between its weight when inflated and that of the quantity of air displaced. In arranging a series of balloon ascents in connection with an exhibition at Edinburgh, it was found that the high class gas usually supplied in Scotland has a greater specific gravity, and, therefore, less ascensional power than English gas. The specific gravity of the latter is 0.42 to 0.45 as compared to air = 1, but the former ranges from 0.5 to 0.6. Remembering that the weight of the balloon, car, etc., is constant, this represents an important difference. And the aeronauts say that Scotch gas has only about half the carrying power of English gas.

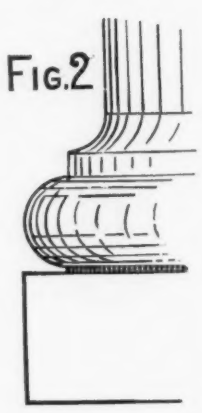
The North British Association of Gas Managers had a very successful meeting at Edinburgh in July last. Their Murdoch Memorial Fund, established last year for the perpetuation of the memory of the "father of gas lighting," has already arrived at the respectable figure of $1,250. The proceedings included papers on the use of common cannels and shales for gas making, regenerator furnaces for small and moderate-sized gas works, tar as fuel, the utilization of residuals, and the uses of coke for industrial and domestic purposes. These very appropriate subjects were fully discussed, so I need not add that the proceedings were interesting and profitable to all concerned, and that the published reports of them will enhance the reputation already enjoyed by this association as a medium for solid practical work. Nor should the excellent presidential address delivered by Mr. Mitchell, of Edinburgh, who was unexpectedly called upon at very short notice to occupy the presidential chair, pass unnoticed. As was remarked at the meeting, if Mr. Mitchell can get up such an able address at a few days' notice, great things may be expected at the next meeting, when he will have had a whole year for the preparation of his speech.

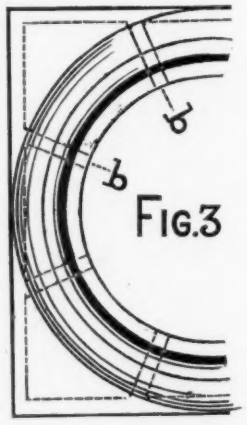
## Columns for Gasholder Framing.

The edition of JOURNAL dated September 16, 1886, contains an article, reprinted from the London *Journal of Gas Lighting*, on "The Economical Construction of Gasholders and Tanks," written by Mr. John Somerville, of London, England. On reading that paper I noticed one or two points in it which seemed somewhat strange, and thought that perhaps, as in the case of yacht building, we might give our English brethren a hint or two in connection with another branch of construction.

The portion of the paper referred to is that which relates to holder columns. Mr. Somerville speaks of cast iron columns and wrought iron lattice columns or standards, but says nothing about columns built out of wrought




iron plates with cast iron caps and bases. The latter style of column has, in this country in recent years, superseded all other kinds for holders of medium and large sizes, and they have stood the test of many seasons; in fact, not one of these, to the knowledge of the writer, has given out in any way or from any cause.

To those not familiar with the method of constructing these columns I would briefly state that the caps and bases consist of cast iron, with seats neatly and exactly turned to receive the wrought iron plates (which are also turned), and the wrought and cast iron secured together with countersunk bolts, as shown in fig. 1. The plates are usually made 1¼ inches thick for the bottom section, diminishing at each section—those at top being only one-quarter inch in thickness. The edges of all the sections are planed and

secured by means of horizontal and vertical butt plates of same thickness as the column plates.

The horizontal joints are not visible after the column is painted, so that the effect is the same as if the columns were in one piece. The vertical joints are placed next the holder, and are thus hidden from view.

Mr. Somerville places great stress on the weakness of the point of juncture of the lower circular member of the base with the square plinth (see *a*, fig. 1). He is, of course, writing of cast iron columns; but in either case the point remains the same. It would seem from his remarks that it is not the custom in England to put vertical ribs in this part of the base—his illustration shows them only inside of the plinth; but in all such work it is our custom to stiffen the base by means of heavy vertical ribs, and plenty of them, extending nearly the whole depth of the casting (see *b b*, figs. 1 and 3). These ribs make the base very strong, and overcome all objections to the architectural feature of which the President, in his after-remarks in the reported discussion, spoke so sneeringly. This condemnation of architectural forms for gasholder frames only proves the fact that good things are often damned by bad workmanship.

The Tuscan column, which is the model followed, has always been considered a thing of beauty; and although they are rather long drawn out and not of proper proportion when used in a double or triple-lift holder, still they are, in the writer's opinion, better looking than any lattice column can possibly appear—and no doubt fully as cheap.

In the discussion which followed the reading of Mr. Somerville's paper the President seems to have thus relieved his mind:

"He (the President) was glad the author of the paper had pointed to the essential weakness of the section at the ogee moulding near the base of cast iron pillars. This was due to the idle attempt of architec's who tried to imitate in a new material what was only suited to an old one."

So it will be seen that the President, and Mr. Somerville as well, overlook the fact that any weakness at the point named may be easily guarded against, and the suspected part may be made as strong if not stronger than any other.

In conclusion, I would beg pardon for my presumption in attempting to instruct the members of the British Institute in anything relating to their business.

W. M.

New York, Sept. 25, 1886.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Schenectady (N. Y.) Gas Company Reorganized.—In the latter part of July rumors were circulated that the owners of control in the Schenectady Gas Company were not averse to the reception of propositions looking to a sale of the property; and such a state of affairs gave rise to much speculation as to the why and wherefore that actuated the owners. It had always been understood that the city on the south bank of the Mohawk river afforded a fruitful field for the gas supplier, and that the outlook for the future was in every sense a promising one. Subsequent developments revealed the truth or accuracy of the initial sales rumors, and now we are in position to supplement our "item" of Aug. 16 with the statement that the McEncroe and Van Vranken share lots—together these gentlemen held about two-thirds of the capital stock—have been purchased by Capt. W. H. White, of New York city. The trade was consummated on Tuesday, September 21, and the newly-elected board of directors consists of Capt. W. H. White, Jno. McEncroe, and Chas. Stanford. Of these Capt. White holds first place, as President; McEncroe being Treasurer and Stanford Secretary. One of the first moves made was to reinstate Mr. Jos. H. Clements in his former position of Superintendent to the Company; and this, while being but a simple act of justice to the gentleman named, who certainly served under the old regime with ability and fidelity, does away with all danger that might ensue from active opposition proceedings in connection with the charter obtained some time ago for a competing gas plant in Schenectady. The property thus transferred includes the entire appurtenances and belongings of a fairly well equipped ten-inch coal gas plant, although no doubt some money will have to be expended in perfecting the distribution system before it will be in keeping with the manufacturing facilities of the works. Besides the gas plant, the Company also owns a Remington arc lighting installation calculated to a duty of 125 lamps. This installation is a perfect specimen of its type, and the power is derived from two 70-horse engines driven from a boiler having a stated capacity of 200 horse power. At the present time Schenectady's street lighting is performed by electricity supplied by the station above mentioned, 86 arcs being the number in duty. The city pays 47 cents per night per light, and the contract requires the lamps to burn all night during 19 nights of each month. The Chief of Police, however, has the right to order the lamps to be lit on those occasions when the moon refuses to honor the demands of the calendar, and, as a consequence, the arcs have so far furnished illumination on an average of 22 nights every month. The station contains four dynamos, and bed plates are in position to receive two others when these will become necessary. It might be added that no attempt has been made so far to secure ordinary customers for arc lights, but the private field has been thoroughly worked up by another electric company, whose managers are operating under the Westinghouse incandescent system. One July 1 the former proprietors of the Gas Company reduced the selling price from $3 to $2.50 per thousand cubic feet, and Capt. White has already instituted a system of discounts in consideration of prompt payment, and based on a certain stated monthly consumption, which now bring the net selling charges to $2.35, $2.25, and $2 per thousand. Last year the Schenectady Gas Company received payment for an output of thirteen million cubic feet, and that simple statement is the best evidence of the value of the field. Indeed, with real business methods in vogue, there is no obstacle to prevent the present owners from securing an increase in output of at least 10 per cent. over that recorded for the present twelvemonth. The business offices of the Company have been removed to the ground floor of the building located on State street and immediately adjoining the Erie Canal—a move sure to be appreciated by the consumers, who, in former times, were obliged to climb up two stairways for the purpose of "handing in their money to the cashier."

The Buffalo (N. Y.) Fuel Gas Company.—Although the managers have put down a goodly mileage of mains in the business and residence divisions of the city, they refuse to state when they will begin to make service connections and commence to supply gas fuel. It is surmised, however, that the uncertainty will not last much longer.

Annual Election, Vincennes (Ind.) Gas Light Company.—The annual meeting of the Citizens Gas Light Company was held on Monday, September 13. The ballot for directors resulted in the choice of Dr. J. H. Rabb and Messrs. Geo. G. Reily, W. H. De Wolf, J. L. Bayard, S. N. Chambers, and Geo. G. Ramsdell. Subsequently Dr. J. H. Rabb was elected to the Presidency, and Mr. Geo. G. Ramsdell was again called upon to undertake the duties of Secretary, Treasurer, and Superintendent. The Company's affairs are in an exceedingly prosperous condition, and those in charge are determined to "keep in the middle of the road," always well to the front.

The Contract to be Annulled.—About a year ago the electrical promoters captured the City Council of Marshalltown, Iowa, and secured a contract under the terms of which the city's streets were to be lighted, by means of the "regular" 2,000-candle power (nominal) arc lamps, for a period of three years. Mr. C. D. Shreve, lessee and operator of the local gas plant, did not feel very much put out at the success of his seeming competitors, and in fact bluntly stated that the electricians would not be tolerated by the municipal authorities long before the proposed three years would have elapsed. Mr. Shreve evidently knew what he was talking about, for he now writes us: "The city officers will to-day (Sept. 16) notify the electric light company of the annullment by the city of the contract by which it lights the city's streets. This is in pursuance of the action of the Council, taken Monday night (Sept. 13), in passing a resolution that such notice be given. By a unanimous vote of all the members present (Councilman Abbott alone being absent) a resolution was adopted—also reciting the provisions of the contract that lights of 2,000-candle power were to be furnished, to burn respectively, according to location, till midnight and 4 A.M.; and the items as to provision and care—which alleged that the lights are really of less than 1,000-candle power; that the lights are unsteady and flickering; that lamps which ought to burn until midnight or 4 A.M. are often extinguished at or before 11 P.M.; that the cranes and masts are unsightly and not of the sort prescribed by the contract, etc." To make the situation still more doleful for the electricians, Brother Shreve has succeeded in cutting down their commercial lights to a total of eleven, and for these their pay varies from $7.50 to $11 each per month. In the meantime the gas output has steadily increased, the reduction in rates, which took effect in January last, having acted in a most pleasing manner. So well satisfied is Mr. Shreve that gas is to continue not only to be the light of the present but the light of the future as well, we now find ourselves called upon to record the fact that he has leased the Nevada (Mo.) and Louisiana (Mo.) gas plants, and will operate them on his own account. The leases took effect on July 1, and, to use Mr. Shreve's own words in regard thereto, "I think I have a good thing." It need not be said, however, that Marshalltown's electricians cannot claim to have "a good thing" just now, although the sale of the remnants of their enterprise may shortly not prove "a bad thing" for the sheriff who will be called in to preside at the obsequies.

Davis & Farnum to Build the New Works at Spencer, Mass.—Spencer, Mass., is to have a gas plant, and Messrs. Davis & Farnum have been authorized to do the work. The contract items include a small retort house to be fitted with one bench of threes; a friction condenser; a set of 5 by 5 purifiers; and a 50 by 18 holder. We presume the Spencer referred to is the post

village of Spencer township, Worcester county, Mass., and some 12 miles west of Worcester city. It is quite a manufacturing center, woollen fabrics and boots being its chief contributions to the commerce of Massachusetts. The township possesses a population of about 6,500 inhabitants.

READY FOR BUSINESS ON AN INCREASED SCALE.—As will be seen from the announcement in the regular advertising department of the JOURNAL, the Albo-Carbon Light Company commences its third season in this country in thoroughly good shape. The facilities for manufacturing the lamps have been largely increased, which not only insures prompt delivery of orders but also enables the Company to put its goods on the market at much lower figures than those hitherto charged. From a glance over the pages of the Company's fall catalogue we note that several new styles of fixtures have been added to the standard line of goods carried, and they have the merit of combining neatness and attractiveness with cheapness of cost—a prime consideration, this latter feature. The goods now being sent out are offered at figures little in advance of those charged for ordinary gas fixtures, and the gas men will not be slow to avail themselves of the means thus offered to fight their only real lighting competitor in this country—kerosene.

THE SIEMENS-LUNGREN COMPANY NOT IDLE.—The Siemens-Lungren Company, of Philadelphia, have enough to do to keep up with the procession in the matter of filling orders. The high-power burner manufacturers are furnishing gas men with the right sort of weapons wherewith to vanquish would-be competitors.

THE HANNIBAL (MO.) TAXPAXERS NOT SATISFIED.—Of course it would be in the nature of a surprise if the Hannibal ratepayers expressed satisfaction as to the tax levy, for we presume the Hannibalites feel quite like the citizens of other localities when it comes to a question of contributing their quota of the moneys exacted for the purpose of "keeping up the government." It must, however, be conceded that the Hannibal folks seem to have good reason for their present disgruntlement, for the public lighting service, which was not long since handed over to the promoters of the local electric lighting company, as at present conducted is nothing short of farcical. The illumination afforded is so slight that all save the promoters agree in characterizing it as fraudulent, and a movement is on foot to abrogate the contract under which the electric company pretends to perform the stated obligations. As an evidence of the existing feeling we reprint the following from the Hannibal *Evening Post*, date of September 20. It might make the case plainer did we state that the *Post* was a strong advocate of electric lighting when the plan was originally broached. The *Post* says: "Our citizens are at a loss to know why the electric lights—especially the tower specimens—are not lighted during the dark nights. Last Saturday (Sept. 18) we were in Egyptian darkness, and for the last month the lights have been very poor indeed. There is something wrong somewhere, and unless a radical change is made it would be far preferable to fall back on gas. The city is paying a heavy tax, and it is but reasonable to expect that the streets should be sufficiently lighted; and if those who have the management of the electric system do not understand it, or can make no improvement they would do well to step down and out." The craze for arc street lighting in the smaller cities and towns of the West seems to have lost much of its former violence, and it is on the cards that a return to sanity on the part of the local rulers will be hailed with joy by those who have been called upon to pay for their (the rulers) desire to keep up with the spirit of the age, the progress of the hour, etc.

PUT THEM UNDERGROUND.—The agitation in regard to the compulsory burial of electric wires, which is now being vigorously carried on in St. Louis, Mo., obtained some practical affirmative support through a curious accident which occurred in that city on the evening of September 16th. One of a sturdy team of bay horses, owned by teamster Jeremiah Murphy, while traveling along the north side of Franklin avenue between Eighth and Ninth streets, stepped on an electric light wire which had fallen from its support. The stroke of the iron-shod hoof severed the insulating material of the wire, and in an instant one of Murphy's bays was no more. The second animal received a shock sufficiently violent to throw it down, but no fatal result followed. The teamster will bring an action to recover the value of the defunct animal. In the meantime, despite the early blossoming appearance which signalized the entrance of Mr. Roswell P. Flower on the New York city Board of Subway Commissioners, it appears as if the poles of the metropolis are more secure in their positions than ever.

A MONTH'S COAL RECEIPTS AT SAN FRANCISCO, CAL.—From an authoritative source we learn that the receipts of coal at the port of San Francisco for the month of August last amounted to 91,700 tons, of which 35,500 were received from Puget Sound and Oregon, the balance coming from foreign countries. In the August receipts no consignments were traceable to the Atlantic States, and but two cargoes came direct from Europe. One European cargo consisted entirely of coke, while a second consignment, a portion of a cargo in a Liverpool vessel, of 400 tons of coke also figures in the receipts. The Robt. L. Belknap arrived on August 30th with 3,826 tons of Seattle coal, consigned to the Renton Coal Company. This is said to be the largest cargo of Puget Sound coal ever put aboard a sailing ship, although a steam coaler, the San Pedro, brings 4,000 short tons of Carbon Hill coal on every trip from the Sound. The sources of the receipts for August, as also for first eight months of 1886, are annexed:

| | For August. Tons. | Jan. 1 to Aug. 31. Tons. |
|---|---|---|
| Puget Sound | 32,362 | 212,392 |
| Oregon | 3,150 | 28,970 |
| Eastern | — | 12,709 |
| Australia | 29,227 | 121,077 |
| British Columbia | 23,249 | 127,908 |
| English | 404 | 15,092 |
| Scotch | — | 4,459 |
| Welsh | 3,308 | 27,287 |
| Totals | 91,700 | 549,894 |
| In 1885 | 60,231 | 607,806 |
| In 1884 | 83,272 | 540,027 |

LIGHTNING AND THE LIMA (OHIO) OIL WELLS.—Despatches from Lima, dated September 23, state that during a violent storm which swept over the city on the day in question, lightning struck the standing derricks over the oil wells on what is known as the "Brotherton lands." The derricks, machinery, tanks—the last contained about 2,400 barrels of oil—were completely destroyed. At 1 P.M. the derrick at the well located close by the Lima gas works received a similar visitation, and a like disastrous result ensued. For a short while it looked as if the gas works would be destroyed, but hard and persistent work averted the threatened danger. A rough estimate placed the pecuniary loss to the oil operators at $25,000.

THE MUNICIPAL COMPANY OF ALBANY, N. Y.—It is the intention of the controllers of the Municipal Company, who have succeeded by purchase to all rights of the old Albany and Peoples Gas Light Companies, to locate the manufacturing plant at North Albany, presumably on the site formerly occupied by the Peoples works. Mr. A. N. Brady, Vice-President of the Municipal, says that the plant of the old Albany Gas Light Company at Grand and Arch streets will be abandoned as soon as the North Albany water gas establishment is completed. He expects to be in readiness with the latter some time during November; and the works will be equal to a make of one million cubic feet per day. Mr. W. A. Allen is in charge of construction details, and if we mistake not he was formerly connected with the Equitable Company of this city. The capital stock of the Municipal Company has been placed at one million dollars.

HAIL TO THE CHIEF!—At the election (during the St. Louis (Mo.) session of the Grand Encampment Knights Templar) for office bearers, Eminent Sir Knight Charles Roome, of New York city, was chosen Most Eminent Grand Master. In thus honoring him, they have honored themselves, for who can wear such title with greater dignity or more worthily than he who has fairly earned the respect and affection of every member of our American gas fraternity?

HAIL TO THE PRESIDENT!—Some Cincinnati (Ohio) politicians, and the manipulators of one or more cheap newspapers, whose proprietors show symptoms of the "itch for office," have been at great pains and much labor to attempt to prove that General Andrew Hickenlooper, President of the Cincinnati Gas Light Company, does not enjoy as great a share of public favor as was formerly accorded him. The aforesaid gentry, pink penny-a-liners included, were no doubt at loss to make their rhymes reason when the result of the recent ballot for a President for Cincinnati's Chamber of Commerce was taken. Of course, the result would not have been so bad for the "ill-favor" predictors if the General had stood for election on the regular ticket; but their confusion receives added force from the fact that Little Andy figured as the leader of the independents, and the further fact that Little Andy triumphed—as usual. If the Queen City Chamber of Commerce is not a heavier authority than the "pink un's" columns, as to a Cincinnati man's popularity and worth in solid business circles, we have nothing more to say.

AN EARTHQUAKE ECHO.—The press reports say that Mr. Sloan, special geological survey agent, in prosecuting his researches around Charleston, S. C., has made some important observations. At the South Carolina Railway wharf, on Cooper river, there is a shed 400 feet in length by 60 feet in width. It is supported on "bents" resting on piles. At the time of the earthquake (August 31) 1,500 tons of guano were stored under the shed. The entire structure was shifted 6 feet 9½ inches toward the southeast. Another dis-

covery, in that it showed the direction of the force, was that the brick casing of the gasholder tank, on Washington street, had been forced 8 inches toward the southeast, and had then recoiled to its original position. The displacement evidence was found in an opening or indentation in the ground, of a width of eight inches, which clearly showed where the brick curbing had pressed back the dirt.

Progress at Peru, Ind.—Mr. Wm. Tracy, Supt. of the Peru American Gas Company, writes that since the reorganization the business is increasing rapidly. He expected to have considerable to do in the way of drumming up consumers, but has been agreeably disappointed. The length of conduit system will be increased by the placing of over three miles of pipe.

Accept Our Congratulations.—Mr. S. Lewis Jones, the *bon homme* who presides at the Secretary's table of the Goodwin Gas Stove and Meter Company, has been a very sick man, but has managed to pull through in good shape. At one time it seemed as if a fatal termination could not be averted, but pluck and vitality saved the day. Just to show that "Richard is himself once more," we quote the following lines from a letter recently received from him: "Am back again at my desk, feeling like a quarter horse, but bronzed to such an extent that I am scarcely recognized by my friends." Better so than be sicklied o'er with a pale cast, eh, Brother Jones?

Gas Rates at Butte City Montana Ter.—In addition to the "item" about the Butte City Gas Light and Coke Company that appeared in our last issue we may further say that the company has about 160 consumers, but owing to the "peculiarities of life" which prevail in mining districts, the 160 will consume as much gas as would be taken up by 250 consumers resident in an Eastern city. Up to July 1st $3.50 was the uniform charge per thousand cubic feet to all grades of consumers; but since that date the following schedule has prevailed:

| | |
|---|---|
| Under 5,000 cu. ft. per month | $3.50 per M. |
| Over 5,000 and under 15,000 cu. ft. per month | 3.00 " |
| All over 15,000 cu. ft. per month | 2.50 " |

Cheaper Gas for Washington, D. C.—On September 18th Mr. Chas. B. Bailey, Secretary of the Washington Gas Light Company, was empowered to make the following announcement to the residents of that city:

For gas consumed on and after Oct. 1st, 1886, the net price will be reduced to $1.25 per thousand cubic feet, as follows:

| | |
|---|---|
| Gross price per 1,000 | $1.50 |
| Discount, if paid in seven days | 25 |
| Net price | 1.25 |

Perhaps this will have the effect of proving to the kitchen-cabinet investigators that the Washington Gas Light Company can be trusted to keep its pledges, although we do not pretend it will cut off the balderdash so freely indulged in by the Dodges, *et al*, who abound in Washington just as the Sherwoods do in New York. The new rate needs no explanation, on the score of cheapness, to make it apparent to every gas man in the country that Washington's gas consumers are exceptionally favored in being served by the company that operates in the district. Its record is perfect in every respect, and in contrast thereto we may point to the Empire City where similar rates—not voluntarily made, however—prevail. The Washington case points the moral, and the New York case makes that moral plain to those possessed of honesty and intelligence. The only certain way of securing cheap gas is to guarantee possession of the field to one company. If that rule had been adhered to in this city gas would now be at less than a dollar a thousand, but the lawmakers—save the title—have caused that to be an impossibility. Mr. McIlhenny and his associates have, in their last move, simply done what they said they would do—reduce the selling rates when such a course was justified by the receipts of the company.

The Meter Inspector's Returns.—During the kitchen-cabinet investigation some of the New York dailies, notably the *Tribune*, indulged in certain wild remarks over the "fastness" of the meters owned by the Washington Gas Light Company. It was asserted that Dr. Ford, U. S. Inspector of gas meters for the District of Columbia, testified before the kitchen committee that "of 150 meters tested two-thirds were found to register more gas than really passed through them." Here are the results of Dr. Ford's work, *vide* his official report to Secretary Lamar, for the fiscal year ended June 30th, 1886, in as far as the meters are concerned: "On account of the fire in the *Post* building, and the injury to the instruments caused thereby, the inspection of meters could not be resumed until the latter part of last October. There were, however, 935 meters inspected and proved for the Washington and Georgetown Gas Companies and consumers of gas, including two meters proved for the Alexandria Company, and one for the Annapolis Company. The results of the inspection were as follows: 81 registered fast, with an average error of 3.54 per cent.; 73 registered slow, with an average error of 8.40 per cent.; 754 registered within the limits allowed by law—two per cent. either way—and 25 *did not register the gas passing through* them at all; 170 meters were inspected and proved on complaint, 117 of them being complained of by consumers of gas. Of these 56 registered against the consumers, the average error being 3.57 per cent., while 19 registered slow, the average error being 5.60 per cent., and 33 registered within the limits allowed by law; 53 meters were complained of by the gas companies, and 3 were found to register fast, the average error being 3.16 per cent.; 24 registered slow, the average error being 12.74 per cent.; 4 registered within the limit; and 22 did *not register at all.*" The *Tribune's* mathematician might construct some nice percentage tables out of the above figures, but these would furnish very little consolation to those who, like the Dodges and the Sherwoods, are happiest when inventing and circulating malicious libels concerning those engaged in the supply of gas.

## How Saccharine was Discovered.

A late issue of the *American Analyst* contains the following interesting remarks, spoken by Dr. Constantine Fahlberg, in regard to the manner in which he discovered saccharine. The Doctor said:

"How did I discover saccharine? Well, it was partly by accident and partly by study. I had worked a long time upon the compound radicals and substitution products of coal tar, and had made a number of scientific discoveries that are, so far as I know, of no commercial value. One evening I was so interested in my laboratory that I forgot about supper until quite late, and then rushed off for a meal without stopping to wash my hands. I sat down, broke a piece of bread, and put it to my lips. It tasted unspeakably sweet. I did not ask why it was so, probably because I thought it was some cake or sweetmeat. I rinsed my mouth with water and dried my moustache with my napkin, when, to my surprise, the napkin tasted sweeter than the bread. Then I was puzzled. I again raised my goblet, and, as fortune would have it, applied my mouth where my fingers had touched it before. The water seemed syrup. It flashed upon me that I was the cause of the singular universal sweetness; and I accordingly tasted the end of my thumb, and found that it surpassed any confectionery I had ever eaten. I saw the whole thing at a glance. I had discovered or made some coal tar substance which 'out-sugared' sugar. I dropped my supper and ran back to the laboratory. There, in my excitement, I tasted the contents of every beaker and evaporating dish on the table. Luckily for me, none contained any corrosive or poisonous liquid. One of them contained an impure solution of saccharine. On this I worked for weeks and months, until I had discovered its chemical composition, its characteristics and reactions, and the best modes of making it scientifically and commercially. When I first published my researches some people laughed as if it were a scientific joke; others, of a more sceptical turn, doubted the discovery and the discoverer; and still others proclaimed the work as being of no practical value. When the public first saw saccharine, however, everything changed. The entire press, European and American, described me and my sugar in a way that may have been edifying, but was simply amusing to me. And then came letters. My mail has run as high as 60 a day—people wanting samples of saccharine, my autograph, or my opinion on chemical problems; desiring to become my partners, to buy my discovery, to be my agents, to enter my laboratory, and the like.

"What have I done? I have started a company in Germany to manufacture saccharine, with a capital of 2,000,000 marks. They are already at work, and are now producing the new sugar. It costs (or rather we sell it) between $10 and $15 per lb.; but we shall reduce these figures before a year has gone past. I would rather have started in this country, which is my home, but the high price of skilled labor, and the equally high tariff on the crude material of which saccharine is made, deterred me and my friends from so doing. I will say, however, that if applied chemistry continues progressing as it has done in the last decade, we shall open branch works here within the next five years. Saccharine is proving a wonderful success. It is used already in many ways. Prof. Leyden, of Berlin, recommended it to sweeten fine wafers and other foods for invalids, and wrote a formula for it in such cases. This is used by bakers and confectioners. It is also employed by the makers of glucose and beet sugar. These are inferior in sweetness to cane sugar, but superior in digestibility and healthfulness. The addition of a trifling fraction of saccharine makes them the equals of the finest cane sugar in the market. Saccharine is so sweet that a teaspoonful converts a barrel of water into syrup. A small wafer of it changes the bitterest quinine solution or acid drink into a regular molasses. It will, therefore, be invaluable in disguising and destroying all the bitter and sour tastes in medicine, without changing the character or action of the drugs. Saccharine does not decay, mould or ferment; neither is it attacked by bacteria. It has no injurious effect upon the human system. What effect has been noticed is rather beneficial than otherwise. This immunity from decay will render it of great utility in pickling and preserving delicate vegetables and meats. Where sugar is used as a flavor and not as a food, there, I think, it is bound to be replaced by saccharine; where as food and flavor combined it will not be. In future the new sugar will be used by druggists, physicians, bakers, confectioners, candy makers, preserve and pickle makers, liquor distillers, wine makers, and dealers in bottlers' supplies."

## The Market for Gas Securities.

Nothing of moment has transpired within the fortnight in connection with the city gas share market. Consolidated is fairly steady, quotations, however, being on the weak side. At noon to-day (Sept. 30) the tape records a transaction at 79, and in spite of the bearish efforts of Walden & Lawrence, who are assisted in their attempts by other bear operators, it looks as if Consolidated would soon take an upward turn. Other city shares are dull. The Brooklyn situation remains unchanged, if anything a slight improvement may be noted. The Fulton Municipal Company pays a regular quarterly dividend of three per cent. on October 15th. At auction: 420 shares Peoples, Brooklyn, at 70; 80 shares Northern, N. Y., at 36; 100 shares old Brooklyn, at 113. Baltimore (Md.) shares are weaker, at 47½; we would, however, advise a purchase of those securities at anything under 50.

## Gas Stocks.

**Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,**

16 Wall St., New York City.

October 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

| | Capital. | Par. | Bid | Asked |
|---|---|---|---|---|
| Consolidated | $35,430,000 | 100 | 78½ | 79 |
| Central | 440,000 | 50 | — | — |
| " Scrip | 220,000 | — | 47 | 57 |
| Equitable | 2,000,000 | 100 | 110 | 112 |
| " Bonds | 1,000,000 | — | 113 | 115 |
| Harlem, Bonds | 170,000 | — | — | — |
| Metropolitan, Bonds | 658,000 | — | 113 | — |
| Mutual | 3,500,000 | 100 | 101 | 103 |
| " Bonds | 1,500,000 | 1000 | 104 | 106 |
| Municipal, Bonds | 750,000 | | — | — |
| Northern | 125,000 | 50 | 36 | — |
| " Scrip | 108,000 | | | |
| Yonkers | | 50 | 51 | 55 |
| Richmond Co., S. I. | 300,000 | 50 | 50 | — |
| " Bonds | 40,000 | — | — | — |
| Gas Co's of Brooklyn. | | | | |
| Brooklyn | 2,000,000 | 25 | 110 | 112 |
| Citizens | 1,200,000 | 20 | 66 | 68 |
| " S. F. Bonds | 320,000 | 1000 | — | 105 |
| Fulton Municipal | 3,000,000 | 100 | 149 | 150 |
| " Bonds | 300,000 | | — | 105 |
| Peoples | 1,000,000 | 10 | 70 | 71 |
| " Bonds | 290,000 | — | — | 103 |
| " " | 250,000 | — | — | 102 |
| Metropolitan | 1,000,000 | 100 | 82 | 85 |
| Nassau | 1,000,000 | 25 | 110 | 112 |
| " Ctfs | 700,000 | 1000 | — | 101 |
| Williamsburgh | 1,000,000 | 50 | 130 | — |
| " Bonds | 1,000,000 | — | — | 111 |
| Out of Town Gas Companies. | | | | |
| Buffalo Mutual, N. Y. | 750,000 | 100 | 90 | 95 |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Citizens, Newark | 918,000 | 50 | 130 | 138 |
| " " Bonds | 124,000 | — | 105 | 110 |
| Chicago Gas Co., Ills | 5,000,0000 | 25 | 128 | 135 |
| Peoples G. L. & C. Co., Chicago, Ills | 3,000,000 | | 8 | 12 |
| Cincinnati G. & C. Co. | | | 190 | 194 |
| Consolidated, Balt. | 6,000,000 | 100 | 47½ | — |
| " Bonds | 3,600,000 | | 107 | 107½ |
| Chesapeake, Balt. | 1,500,000 | 100 | — | 70 |
| " | 1,000,000 | | 100 | 102 |
| Central, S. F., Cal. | | | 70 | 72 |
| Capital, Sacramento, Cal. | | | 54 | 56 |
| Hartford, Conn | 750,000 | 25 | 140 | 142 |
| Jersey City | 750,000 | 20 | 155 | — |
| Laclede, St. Louis, Mo. | 1,600,000 | 100 | 110 | 112 |

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## Position Wanted

**As Superintendent of Gas Works.**

Over thirty years' experience. A thorough gas man and master mechanic. Best of references. Address

655-1 "A. M.," care this Journal.

## Superintendent's Position Desired

By a practical man of twenty-five years' experience in the manufacture and distribution of coal and water gas. Satisfactory references given. Address

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## Situation Wanted

**AS SUPERINTENDENT OF GAS WORKS.**

Can come well recommended as to character and ability. Address "GAS SUPERINTENDENT,"

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## SITUATION WANTED

**As Superintendent of Gas Works.**

Has filled the position of engineer and superintendent of gas works for eight years. Understands the manufacture and distribution of gas, laying mains and services, the fixture and fitting business, and keeping accounts. Good references given.

Or would prefer to lease a works in a good city or town of 6,000 or 10,000 inhabitants, and would endeavor to advance th interests of the stockholders.

Address GEO. M. McCONAUGHEY,
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**4 Plain Inside Hanging Siemens Lamps,**

Complete and in good order. $25 each. Taken from a rink for debt, and sold for want of use. Apply to

GAS LIGHT COMPANY,
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**Gas Works**

IN A GROWING WESTERN CITY.

Reason for selling, owner's inability to give his attention to the business. Address

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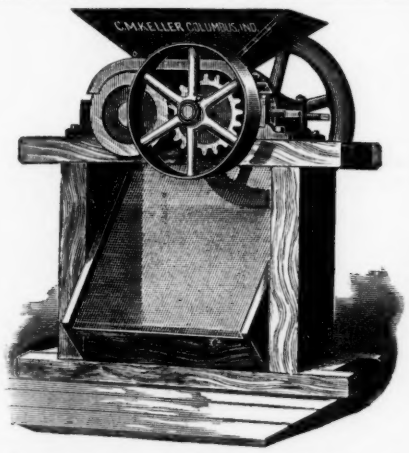
## FOR SALE—A BARGAIN.

**One Set of Four Purifiers,** with cast iron boxes. Size of boxes, 10x12 ft., with 12 in. connections and dry center seal. Also, **Four Cylinder Condensers** and **One Washer. One 10 H.P. Engine,** and **One 40 H.P. Boiler. Shafting, Pulleys, etc.** For particulars, address

652-4 MUNICIPAL GAS CO., ALBANY, N. Y.




## Keller's Adjustable Coke Crusher.

**SIMPLE, STRONG, AND DURABLE.**

C. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

**Correspondence Solicited.**

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## GAS COMPANIES, ATTENTION!

Increase the demand for Coke by using the

## Star Coke Breaker.

SIMPLE, CHEAP, DURABLE. EASILY SHARPENED BY ANY BLACKSMITH.

B. J. ALLEN, Newark Gas Co., Newark, N.J.

## MITCHELL, VANCE & CO.,

MANUFACTURERS OF

## Chandeliers

and every description of

## GAS FIXTURES.

Also manufacturers of Fine Gilt Bronzes and Marble Clocks, warranted best time-keepers. Mantel Ornaments, etc.

**Salesrooms, 836 Broadway, N. Y.**

Special Designs furnished for Gas Fixtures for Churches, Public Halls, Lodges, etc.

## "CHICAGO" Gas Stoves

MEET A LONG-FELT WANT, IN THAT THEY ARE

ATTRACTIVE IN APPEARANCE,

Economical in Consumption,

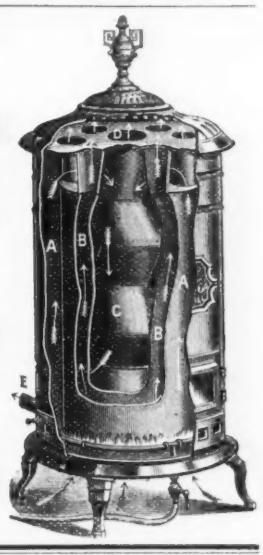
AND

MOST EFFECTIVE AS HEAT PRODUCERS.

MANUFACTURED BY THE

## CHICAGO GAS STOVE CO.

**69 Lake St., Chicago, Ill.**




## GIBBS PORTLAND CEMENT

Is guaranteed to be the finest English brand, and unsurpassed by any grade imported for making concrete and setting masonry.

**Extract of Paper, with tests, read before the American Society of Civil Engineers, sent on application.**

HOWARD FLEMING,

**Sole Agent for U. S.,**

**23 Liberty St., New York.**

## GEROULD'S IMPROVED RETORT CEMENT.

A Cement for patching retorts, putting on mouthpieces, and making up all bench-work joints. This Cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick. For recommendations and price list address

C. L. GEROULD,

**Manchester, N. H.**

## GAS vs. ELECTRIC LIGHT.

We would invite attention to the able and exhaustive argument of General A. Hickenlooper, President of the Cincinnati Gas Light and Coke Company, contained in a handsome pamphlet of 96 pages, entitled

"EDISON'S INCANDESCENT ELECTRIC LIGHTS FOR STREET ILLUMINATION. REPORT OF AN ARGUMENT DELIVERED BY A. HICKENLOOPER BEFORE THE COMMITTEE ON LIGHT, MUNICIPAL COUNCIL, CITY OF CINCINNATI, JULY 22, 1886."

This is a subject of special interest to all Gas Light Companies.

**Prices.**

| | | | |
|---|---|---|---|
| 50 copies..... | $12.50 | 250 copies..... | $50.00 |
| 100 copies..... | 22.50 | 500 copies..... | 87.50 |

A sample copy will be sent by mail on receipt of 50 cts.

**A. M. CALLENDER, & CO.,** 42 PINE ST., N. Y. CITY

## Notice to Gas Companies.

We desire to inform you that letters patent of the United States No. 345,368, applied for on November 21, 1885, were issued to us on July 13, 1886, for an improvement in Automatic Gas Governors, which improvement is set forth in the claim of said patent as follows, viz.:

"The combination of an automatic gas governor so constructed as to automatically increase or diminish the pressure at its outlet in proportion to the volume of gas passing through it, and an adjustable valve so constructed and arranged as to be capable of adjustment to pass different volumes of gas without changing the length of stroke or travel, substantially as and for the purpose specified."

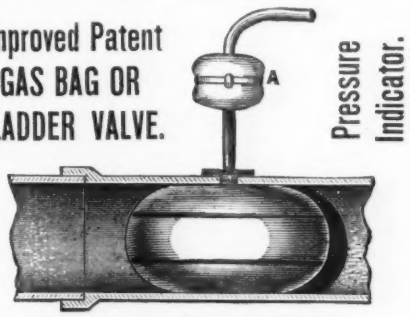
We desire to notify you that we consider that any automatic gas governor having such an adjustable valve is covered by the said patent, and that all automatic governors containing such valves not made by us are infringements of our said patent. We give this notice that all persons may be informed of our claim, so that no one may ignorantly infringe upon our rights.

Very respectfully,

**T. E. & J. S. CONNELLY,**

Of CONNELLY & CO., LIMITED.

Improved Patent GAS BAG OR BLADDER VALVE.




MANUFACTURED BY

**PEERLESS MFG. CO., 34 Murray St., N.Y.**

# TO ALL WHOM IT MAY CONCERN.

Notice is hereby given that a suit is now pending in the U. S. Circuit Court for the Northern District of Illinois against the Chicago Gas Apparatus Manufacturing Company and Newman A. Ransom, for infringing our rights under Letters Patent of the United States No. 247,925, dated October 4th, 1881, and No. 333,862, dated January 5th, 1886; and that a similar suit for like infringement has been instituted against W. S. Horry (trading as the Crystal Carbon Light Company), Arthur Kitson (trading as Kitson & Co.), and others, in the U. S. Circuit Court for the Eastern District of Pennsylvania. All persons in anywise infringing upon our rights under said Letters Patent will be prosecuted by us upon our obtaining proof of such infringement.

WALTER J. KIDD, General Manager.

## THE ALBO-CARBON LIGHT COMPANY, - - NEWARK, N. J.

**SOLE MANUFACTURERS FOR THE UNITED STATES.**

TRADE MARK.

# THE CRYSTAL CARBON LIGHT!

## THE SMOKE NUISANCE ENTIRELY OVERCOME!

## The Latest and Most Improved Carbon Light!

**SPECIAL NOTICE TO GAS COMPANIES.**

Will all Gas Companies who have addressed us since Sept. 1st kindly notify us where they have not received our answers? Our mail matter since the 1st has been fraudulently obtained by an agent of our competitors, against whom we are about to instigate criminal proceedings.

We cannot exchange any more Crystal Carbon Light Fixtures for Albo-Carbon, as we already have a large stock of the latter on hand; but for any who desire we will apply our improved smokeless heater for a small charge, which will effectually prevent the smoking nuisance. Our latest pattern of Billiard Light Fixture will be ready next month.

# CARBONCRYSTAL.

(Trade Mark.)

A new and superior preparation for enriching gas used in conjunction with Crystal Carbon or Albo-Carbon gas lights. The preparation is cleaner and better adapted for filling burner vessels than any hitherto produced. Guaranteed to be chemically pure. Supplied in cans from 10 pounds up.

## CRYSTAL CARBON LIGHT CO.,

**Main Office, No. 1018 Chestnut Street, Philadelphia, Pa.**

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**HOWARD FLEMING,**
23 Liberty St., New York.
IMPORTER of
"BRIDGEND" "DINAS"
**Silica FIRE Bricks**
FOR COKE OVENS AND GAS WORKS.
PORTLAND AND ROMAN CEMENTS.
Correspondence Invited. Lowest Prices.

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**To Gas Companies.**

We make to order **CAP BURNERS** to burn any amoun under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

**C. A. GEFRORER,**
248 N. 8th Street, Phila., Pa.

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Taylor's AUTOMATIC GAS CHECK.

Pat. Sept., 1885. Just the thing for street lamps. No moving parts; only the gas moves, and checks itself by opposing currents; cannot get out of order or wear out; the cheapest and best of all governors. Samples, by mail, 10 cents. Send for circular.

G. TAYLOR, 60 Duane st., N. Y.

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# NATIONAL GAS LIGHT AND FUEL COMPANY,

Sole Owners and Licensees of the Springer Patent Cupola and Process for the U. S.,

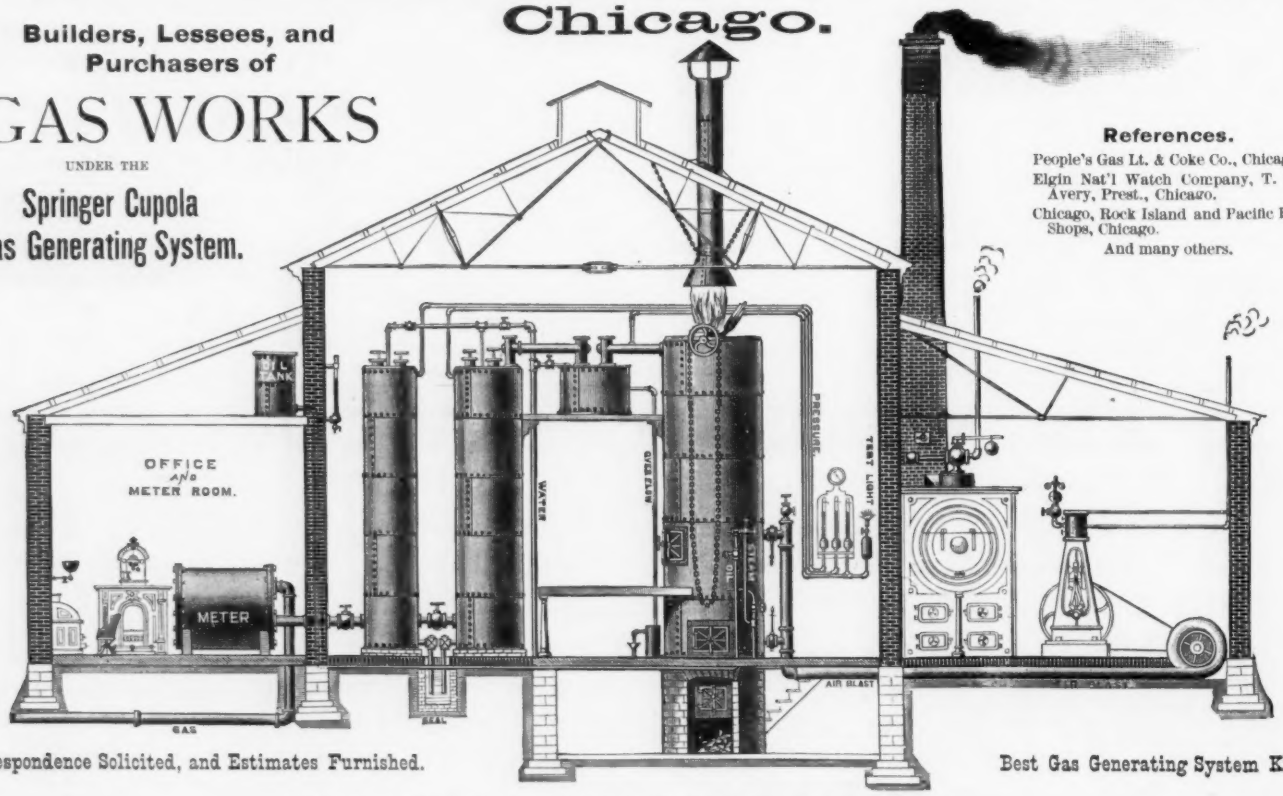
**Builders, Lessees, and Purchasers of**

## GAS WORKS

UNDER THE

**Springer Cupola Gas Generating System.**

**Chicago.**




**References.**

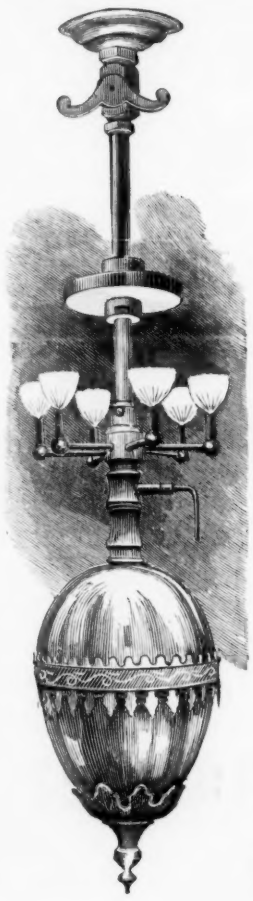
People's Gas Lt. & Coke Co., Chicago.
Elgin Nat'l Watch Company, T. M. Avery, Prest., Chicago.
Chicago, Rock Island and Pacific Ry. Shops, Chicago.
And many others.

Correspondence Solicited, and Estimates Furnished.

Best Gas Generating System Known.

Orders from Cities, Towns, and Public Institutions Promptly Executed. Address

**NATIONAL GAS LIGHT AND FUEL COMPANY, - - - - No. 218 La Salle Street, Chicago, Ill.**



# THE ALBO-CARBON LIGHT.

This most successful of all methods of enriching gas is based on the use of heated gas to vaporize a solid hydrocarbon, thus

**COMBINING THE ADVANTAGES OF PREHEATING AND CARBURETTING.**

The incoming gas passes over an extended heating surface (heated by means of the illuminating flames), and is raised to the temperature necessary to vaporize the carburetting material, which is a white, crystaline solid prepared from coal tar.

Two Seasons of Practical Use in all parts of the Country have amply demonstrated that the Albo-Carbon Light stands unrivaled for

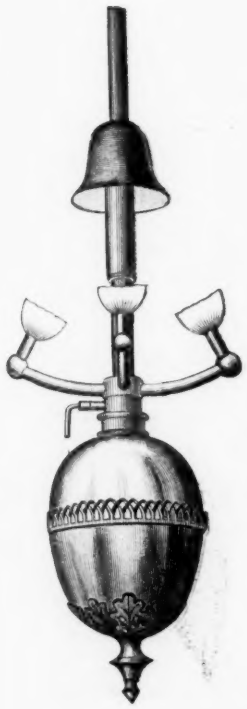
## ECONOMY, BRILLIANCY, EFFICIENCY.

**Gas Companies are Finding this System Superior to All Others**

in enabling them to meet competition, as its adaptability to various requirements makes it equally as desirable to replace a KEROSENE LAMP, an INCANDESCENT LIGHT, or an ARC LIGHT.

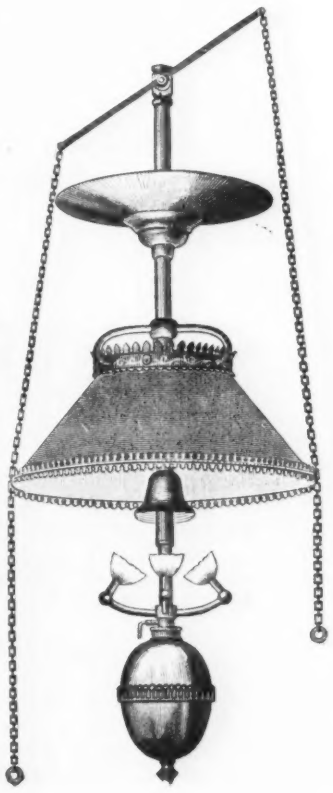
**Our Apparatus are made in all Sizes, from 1 to 48 Lights (25 to 1,500 C. P.)**

To enable Gas Companies to still more successfully meet this competition and to offer to the public still cheaper forms of our lights, we have added



**New and Attractive Designs at Low Prices.**

Send for Illustrated Catalogue and New Price List.



### NOTICE.

Suits are pending in the U. S. Circuit Courts in Illinois and Pennsylvania against various persons for infringement of our Letters Patent No. 247,925, dated Oct. 4, 1881, and No. 333,862, dated Jan. 5, 1886. All persons are cautioned against manufacturing, selling, or using any apparatus or material which infringes our Patents. We intend to commence suits against all parties infringing Patents owned by us.

## The Albo-Carbon Light Co.,

**NEWARK, N. J.,**

**Sole Manufacturers for the United States.**

GAS ENGINES. GAS ENGINES. BOOKS.

# THE CLERK GAS ENGINE CO.,

## Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec. S. LEWIS JONES, Asst. Sec. A. J. DOTY, Supt.

The utility and convenience of the Gas Engine being no longer an open question, it only remains now for intending purchasers to select the BEST. We claim for the CLERK GAS ENGINE that it is equal to any other manufactured as regards steadiness in running, simplicity, and ease of keeping in repair, and that it gives the greatest amount of power for the least money (both in first cost and expense of running) of any engine made. In support of this claim we refer to the test of the Gas Engines made under the direction of the American Institute of New York, in December, 1885, and heretofore published in these columns. These engines are especially adapted for continuous running under heavy loads, and we can refer to Engines which have run 22 hours a day for months at a time.

**Made in Sizes of 5, 10, 15, 20, and 25 Horse Power. All Engines Guaranteed for One Year.**

# GAS

## AS A SOURCE OF

# LIGHT, HEAT, AND POWER.

By C. J. R. HUMPHREYS.

**A Pamphlet of twenty-nine pages, treating of the use of Gas as a source of Light, Heat, and Power.**

**DESIGNED FOR DISTRIBUTION BY GAS COMPANIES AMONG THEIR CUSTOMERS AND OTHERS.**

Price, 10 cents each, $5 per 100, $50 per 1,000.

Gas Companies can have their own imprint placed on cover without extra charge. All orders to be sent to

## A. M. CALLENDER & CO.,

**No. 42 Pine Street, N. Y. Citv.**

# GOODWIN'S DIRECTORY

OF THE

# GAS LIGHT COMPANIES OF THE UNITED STATES & CANADA

**Price, . . . . . $10.00.**

Orders may be sent to

**A. M. CALLENDER & CO., No. 42 Pine Street, N. Y. City.**

# CONNELLY'S

# AUTOMATIC GOVERNOR FOR STREET MAINS.

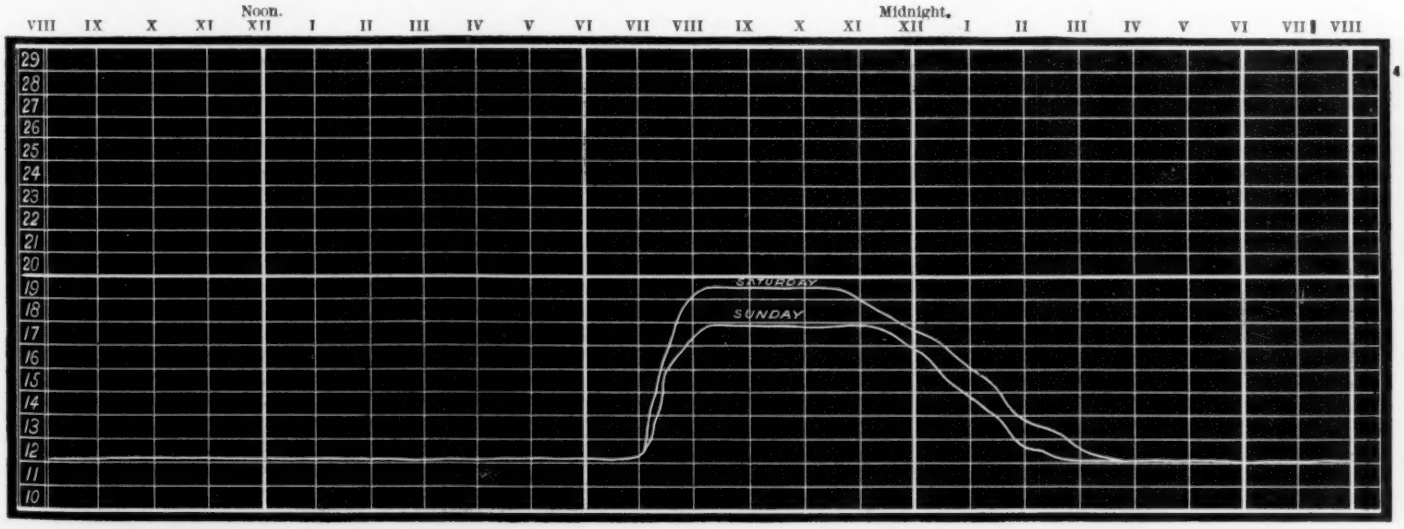
We invite the attention of all practical Gas Managers to the following letter and accompanying cut. The two lines show the pressure held by the Governor on Saturday and Sunday, and clearly illustrates the accuracy of the Governor in *increasing* and *reducing* pressure *in proportion to the volume of gas consumed.*

A Governor that puts the increased pressure on at "one fell swoop" and takes it off in like manner is *not* an "Automatic" Governor; and the circulation of pressure sheets showing such action by a so-called "Automatic" Governor is a rather amusing reflection on the intelligence of Gas Managers.

Strictly speaking, a "Balanced" Governor is an "Automatic" one, as it automatically varies the volume of gas sent out to *maintain a uniform pressure* at its outlet. But, as now applied, the term "Automatic Governor" is understood to mean a Governor that will *maintain pressure between any two desired extremes, in direct proportion to the volume of gas consumed.* Therefore pressure sheets showing *instantaneous changes* from maximum to minimum and *vice versa*, circulated broadcast as the record of an "Automatic (?) Governor," reveals inexcusable ignorance of the subject, amusing to many, yet liable to mislead the inexperienced novice.

We would suggest that all Gas Companies contemplating the placing of *Automatic* Governors would consult their own interests and avoid annoying experience by adopting a Governor *that has a record.*

**CONNELLY & CO., LTD., 177 Broadway, N. Y.**


VIII IX X XI Noon. XII I II III IV V VI VII VIII IX X XI Midnight. XII I II III IV V VI VII VIII
29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10
SATURDAY
SUNDAY

**Card Showing Pressure at the Milwaukee Gas Works, Saturday, July 10, and Sunday, July 11 1886.**

MILWAUKEE, WIS., August 3d, 1886.

MESSRS. CONNELLY & CO., LTD., 177 Broadway, New York:

Gentlemen—Replying to yours of 29th, I send you a little package of register sheets. When your Governor (20-inch) was set I adjusted it to give 13-tenths day pressure and 22-tenths night pressure. Saturday nights it would run up to 25-tenths. Whenever it would cloud up in the daytime it would go up at first indication of darkness to about 15-tenths. I hunted back in the sheets to find one when pressure was increased in the daytime, but it is so long since we have had a stormy day I could not find one. You can, however, see a *slight change* on sheets for June 1 and June 25. You will see, too, that lately the Governor only puts on *about* 20-*tenths maximum pressure.* This is because *less gas is burned than when it was adjusted.* We have no complaints of pressure, and everyone appears satisfied. In conclusion, can say the Governor has *never been touched* since it was first adjusted, and has at all times *done just the work we wished it to do.* Very truly yours, E. G. COWDERY, Engr. & Supt.

T. C. HOPPER'S

AUTOMATIC DIFFERENTIAL GAS GOVERNOR

**Is now in Practical Operation, doing Perfect Automatic Service with Great Precision.**

Others (6, 8, 12 and 16 inch) are now being set; and many more to be shipped soon.

BE SURE TO THOROUGHLY INVESTIGATE THE SUPERIOR MERITS OF THIS GOVERNOR BEFORE PURCHASING.

For Simplicity and Reliable Work it has no Equal. Correspondence Solicited.

**Arch and 22d Streets, Phila., Pa.**

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MUNICH REGENERATIVE FURNACE

System Drs. Schilling and Bunte.

**Greatest Durability! Minimum of Attention!**

**COMPLETE DISTILLATION IN 3½ HOURS.**

Ten to Thirteen Pounds of Coke to Hundredweight of Coal.

NO CLINKER. NO CARBONIC OXIDE IN THE REGENERATIVE FLUES.

**Almost Automatic in Action.**

The Most Successful Regenerative Furnace in Use.

BARTLETT, HAYWARD & CO

**Agents for the United States.**

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ADAM WEBER'S

New and Improved Regenerative Furnace.

**ESPECIALLY ADAPTED FOR USE IN SMALL GAS WORKS.**

**A Saving of at Least Forty per Cent. over Old Methods.**

Cheapness of construction and absence of elaboration are the chief characteristics of this Furnace. It is also applicable in cases where it is not convenient to excavate deeply below the line of the retort house.

Correspondence respectfully solicited. Descriptive Circulars on application.

Manhattan Fire Brick & Enameled Clay Retort Works.

**OFFICE, 633 EAST FIFTEENTH STREET, N. Y. CITY.**

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REPRESENTING

THE BOWER GAS LAMP.

**C. & W. Walker's Carbonic Acid & Tar Extracting Washer**

B. DONKIN & CO.'S PAT. IMP. GAS VALVE.

*Young & Beilby's Patents. Henry Aitkin's Patents.*

**R. P. SPICE, London, Eng. HENRY SIMON, Manchester, Eng.**

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CONNELLY & CO., LTD.

MANUFACTURERS OF

Steam-Jet Exhausters

Requires one-half the flo r space and one-third less steam than any other Exhauster in the market. More cheaply and easily connected, as outside by-pass valves are dispensed with. It is the only Exhauster manufactured having Compensator and Governor combined; the Compensator with all other Exhausters being a separate and distinct machine. It is simple in construction, easily adjusted, not liable to get out of order, and can be operated by ordinary workmen. Over 1,000 now in use.

**No. 177 Broadway, New York.**

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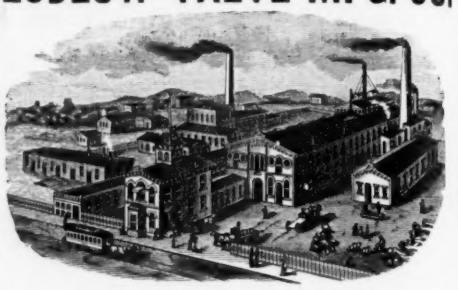
LUDLOW VALVE MFG. CO.



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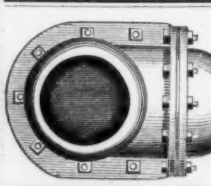

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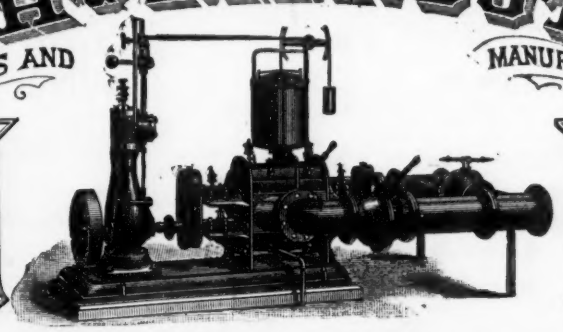

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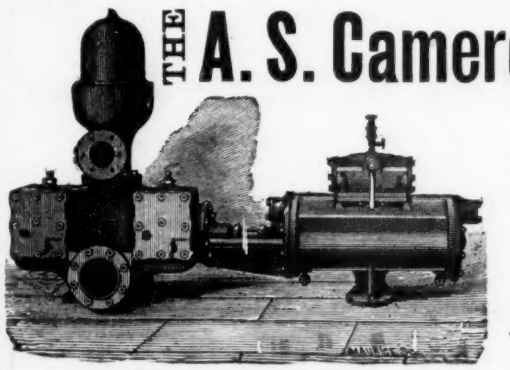

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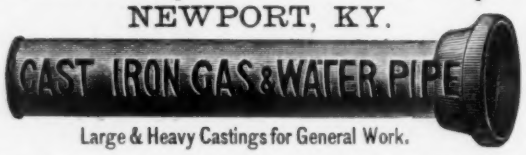


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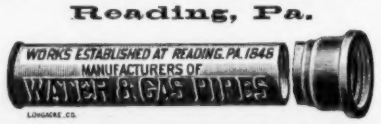


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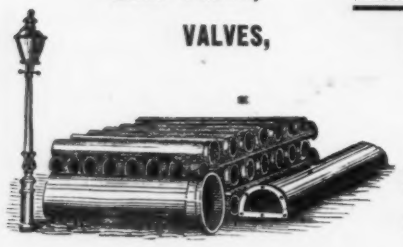

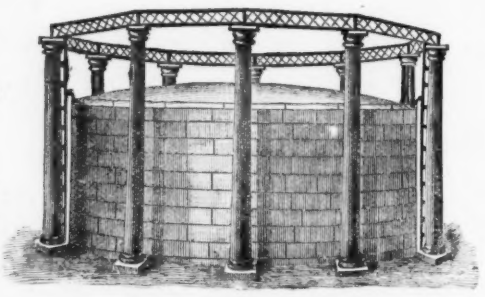

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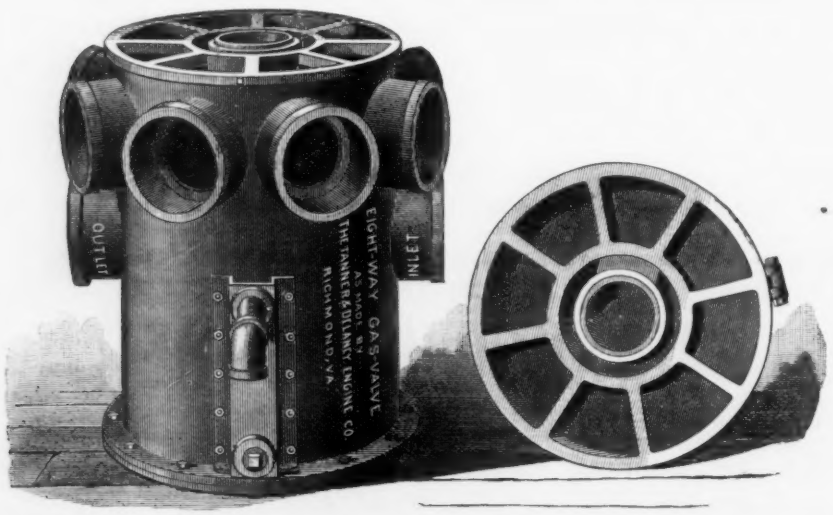


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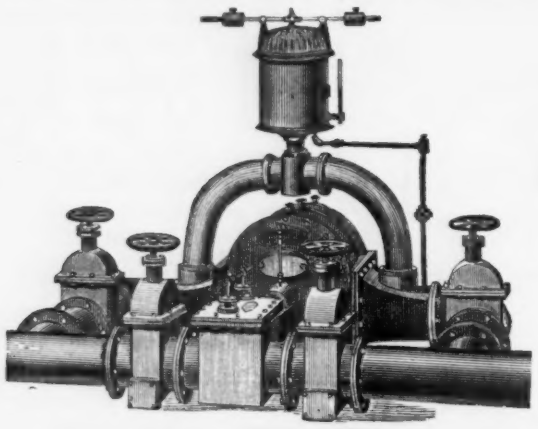

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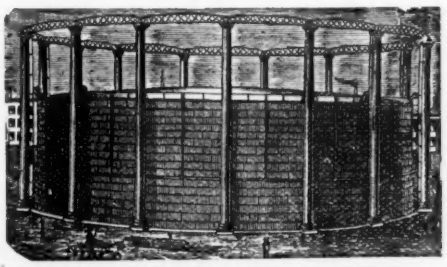

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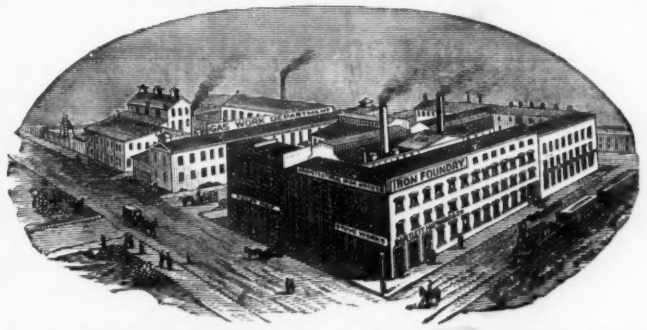


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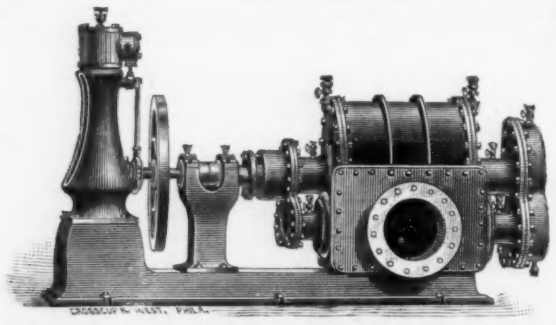

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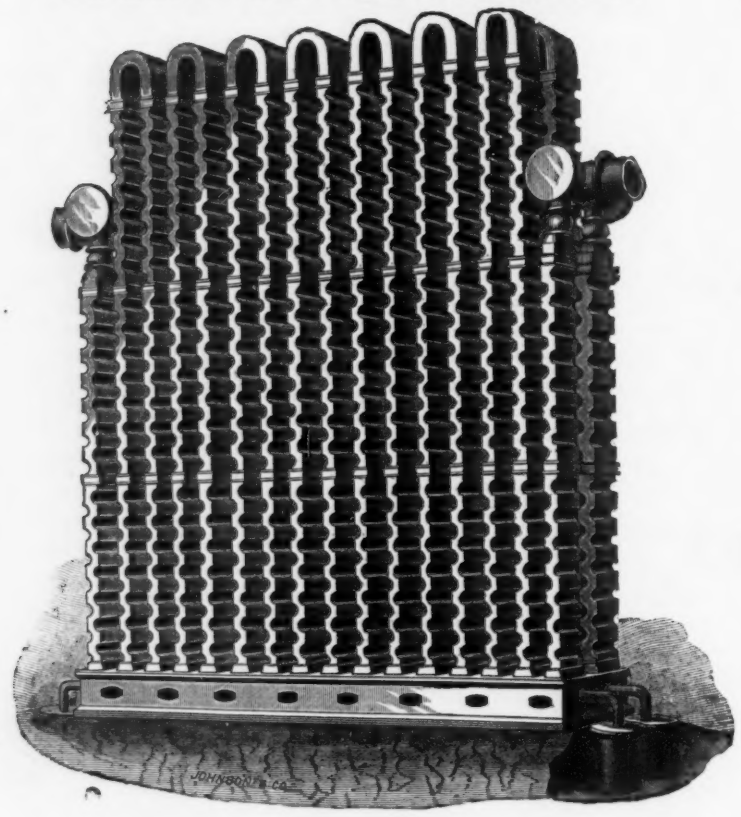

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

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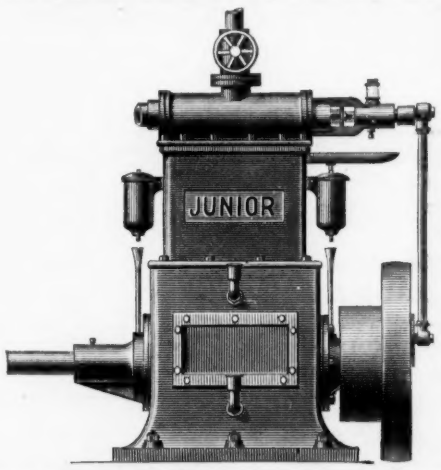


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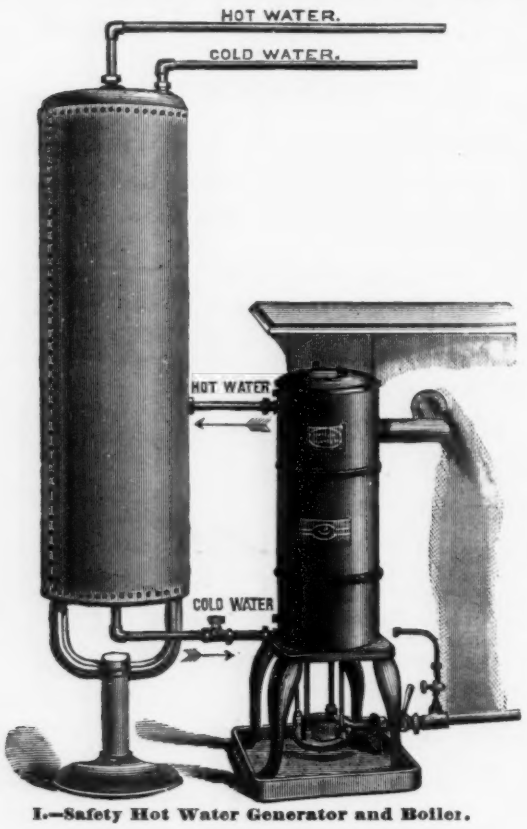


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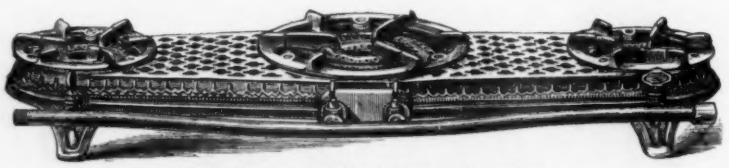

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